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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 61-2F

Version	:	1
Date of issue/ Date of revision	:	12/10/2022
Date of previous issue	:	No previous validation

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 61-2F
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Hydrodesulphurisation catalyst

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to UK CLP/GHS

Eye Dam. 1, H318
Resp. Sens. 1, H334
Skin Sens. 1, H317
Muta. 2, H341
Carc. 1A, H350i
Repr. 1B, H360
STOT RE 1, H372 (lungs, respiratory tract) (inhalation)
Aquatic Chronic 2, H411

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause an allergic skin reaction.
Causes serious eye damage.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Suspected of causing genetic defects.
May cause cancer by inhalation.
May damage fertility or the unborn child.
Causes damage to organs through prolonged or repeated exposure. (lungs, respiratory tract) (inhalation)
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Wear respiratory protection. Avoid release to the environment. Do not breathe dust. Do not eat, drink or smoke when using this product.

Response : Collect spillage. IF exposed or concerned: Get medical advice or attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a POISON CENTER or doctor. Take off contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice or attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

SECTION 2: Hazards identification

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
aluminium oxide	REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥50 - ≤75	Not classified.	[2]
molybdenum trioxide	REACH #: 01-2119488038-30 EC: 215-204-7 CAS: 1313-27-5 Index: 042-001-00-9	≥10 - <20	Eye Irrit. 2, H319 Carc. 2, H351 (inhalation) STOT SE 3, H335	[1] [2]
molybdenum nickel tetraoxide	REACH #: 01-2119529256-38 EC: 238-034-5 CAS: 14177-55-0 Index: 028-057-00-7	≤10	Acute Tox. 4, H302 Resp. Sens. 1, H334 Skin Sens. 1, H317 Muta. 2, H341 Carc. 1A, H350i Repr. 1B, H360 STOT RE 1, H372 (lungs) (inhalation) Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1] [2]
dodecaaluminium	REACH #:	≤10	Not classified.	[2]

SECTION 3: Composition/information on ingredients

trimolybdenum dodecaoxide	01-2119981711-34 EC: 239-183-9 CAS: 15123-80-5			
Silicic acid, aluminum salt	REACH #: 01-2119519214-48 EC: 215-628-2 CAS: 1335-30-4	≤5	Eye Dam. 1, H318	[1]
dialuminium nickel tetraoxide	REACH #: 01-2119421252-55 EC: 234-454-8 CAS: 12004-35-2 Index: 028-057-00-7	≤3	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 (lungs, respiratory tract) (inhalation)	[1] [2]
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≤3	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In the event of any complaints or symptoms, avoid further exposure.

SECTION 4: First aid measures

Skin contact : Get medical attention immediately. Call a poison center or physician. Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced foetal weight
increase in foetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
reduced foetal weight
increase in foetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
stomach pains
reduced foetal weight
increase in foetal deaths
skeletal malformations

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

SECTION 4: First aid measures

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
phosphorus oxides
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

SECTION 6: Accidental release measures

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitisation problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Prior to discharge the material may contain residual hydrocarbons. The material should be purged free of hydrocarbons and cooled with an inert gas before it is discharged. The material may also contain deposited carbon and should be regarded as potentially pyrophoric when hot. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. The reduced material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities :

SECTION 7: Handling and storage

Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

Seveso Directive - Reporting thresholds

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E2	200 tonne	500 tonne

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [aluminium oxides]** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
molybdenum trioxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [molybdenum insoluble compounds]** STEL: 20 mg/m³, (as Mo) 15 minutes. TWA: 10 mg/m³, (as Mo) 8 hours.
molybdenum nickel tetraoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [molybdenum insoluble compounds]** STEL: 20 mg/m³, (as Mo) 15 minutes. TWA: 10 mg/m³, (as Mo) 8 hours.
dodecaaluminium trimolybdenum dodecaoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [molybdenum soluble compounds]** STEL: 10 mg/m³, (as Mo) 15 minutes. TWA: 5 mg/m³, (as Mo) 8 hours.
dialuminium nickel tetraoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Respirable dust	***[Air contaminant]***

SECTION 8: Exposure controls/personal protection

Inhalable fraction	**EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours. ***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
molybdenum trioxide	DNEL	Long term Inhalation	16.8 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	3.33 mg/m³	Workers	Local
molybdenum nickel tetraoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors
molybdenum trioxide	Fresh water	19.05 mg/l	Sensitivity Distribution
	Fresh water sediment	33900 mg/kg dwt	Equilibrium Partitioning
	Soil	14.25 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	32.55 mg/l	Assessment Factors
molybdenum nickel tetraoxide	Fresh water	0.0036 mg/l	Assessment Factors
	Marine water	0.0086 mg/l	Assessment Factors
	Soil	29.9 mg/kg	-
	Sewage Treatment Plant	0.33 mg/l	-
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water	109 mg/kg dwt	Assessment Factors

SECTION 8: Exposure controls/personal protection

	sediment		

8.2 Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible. Goggles, face shield or other full-face protection should be worn if there is a risk of direct exposure to dust. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

SECTION 8: Exposure controls/personal protection

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [extrudates]

Colour : Green.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Bulk Density (g/ml) : 0.7 - 1

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not available.

Particle characteristics

Median particle size : Not available.

SECTION 9: Physical and chemical properties

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
molybdenum trioxide	LC50 Inhalation Dusts and mists	Rat	>5.05 mg/l	4 hours
	LD50 Dermal	Rat	>2 g/kg	-
	LD50 Dermal	Rat	>2000 mg/kg	-
	LD50 Oral	Rat	2689 mg/kg	-
molybdenum nickel tetraoxide	LD50 Oral	Rat	500 mg/kg	-

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
KATALCO 61-2F	3821.4	N/A	N/A	N/A	N/A
molybdenum trioxide	2689	N/A	N/A	N/A	N/A
molybdenum nickel tetraoxide	500	N/A	N/A	N/A	N/A
molybdenum nickel tetraoxide	500	N/A	N/A	N/A	N/A

SECTION 11: Toxicological information

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Causes serious eye damage.

Respiratory : Not classified.

Sensitisation

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Respiratory : May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Mutagenicity

Conclusion/Summary : Suspected of causing genetic defects.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : May damage fertility.
May damage the unborn child.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target organs
molybdenum trioxide	Category 3	-	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 61-2F	Category 1	inhalation	lungs, respiratory tract
molybdenum nickel tetraoxide	Category 1	inhalation	lungs
molybdenum nickel tetraoxide	Category 1	inhalation	lungs
dialuminium nickel tetraoxide	Category 1	inhalation	lungs, respiratory tract
nickel monoxide	Category 1	-	-

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye damage.

SECTION 11: Toxicological information

Inhalation : May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin contact : May cause an allergic skin reaction.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced foetal weight
increase in foetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
reduced foetal weight
increase in foetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
stomach pains
reduced foetal weight
increase in foetal deaths
skeletal malformations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure if inhaled.

General : Causes damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Suspected of causing genetic defects.

Reproductive toxicity : May damage fertility or the unborn child.

SECTION 11: Toxicological information

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
aluminium oxide	EC50 >100 mg/l	Daphnia - magna	48 hours
	IC50 >100 mg/l	Algae - (Selenastrum capricornutum)	72 hours
	LC50 >100 mg/l	Fish - (Trout Trotten)	96 hours
molybdenum trioxide	Acute LC50 203.2 mg/l Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours
	Acute LC50 70000 µg/l Fresh water	Fish - Fathead minnow - Pimephales promelas	96 hours
molybdenum nickel tetraoxide	Acute EC50 0.75 mg/l Fresh water	Algae - Algae - Exponential growth phase	72 hours
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0014 mg/l Fresh water	Crustaceans - Lymnaea stagnalis	30 days
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

Conclusion/Summary : Toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The bioaccumulative criteria are not applicable to inorganic metals

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 12: Ecological information

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Yes.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Waste catalogue

Waste code	Waste designation
16 08 02*	spent catalysts containing hazardous transition metals or hazardous transition metal compounds

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN3077	UN3077	UN3077	UN3077
14.2 UN proper shipping name	Environmentally hazardous substance, solid, n. o.s. (molybdenum nickel tetraoxide)	Environmentally hazardous substance, solid, n. o.s. (molybdenum nickel tetraoxide)	Environmentally hazardous substance, solid, n. o.s. (molybdenum nickel tetraoxide)	Environmentally hazardous substance, solid, n. o.s. (molybdenum nickel tetraoxide)

SECTION 14: Transport information

14.3 Transport hazard class (es)	9 	9 	9 	9 
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Hazard identification number 90
Limited quantity 5 kg
Special provisions 274, 335, 601, 375
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Special provisions 274, 335, 375, 601

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Emergency schedules F-A, S-F
Special provisions 274, 335, 966, 967, 969
IMDG Code Segregation group SGG7 - Heavy metals and their salts (including their organometallic compounds)

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.
Quantity limitation Passenger and Cargo Aircraft: 400 kg. Packaging instructions: 956. Cargo Aircraft Only: 400 kg. Packaging instructions: 956. Limited Quantities - Passenger Aircraft: 30 kg. Packaging instructions: Y956.
Special provisions A97, A158, A179, A197, A215

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E2

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes
dialuminium nickel tetraoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Air	:	Not listed
Industrial emissions (integrated pollution prevention and control) - Water	:	Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	All components are listed or exempted.
Canada	:	At least one component is not listed in DSL but all such components are listed in NDSL.
China	:	At least one component is not listed.
Eurasian Economic Union	:	**Russian Federation inventory**: All components are listed or exempted.
Japan	:	**Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	At least one component is not listed.
Philippines	:	Not determined.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Eye Dam. 1, H318	Calculation method
Resp. Sens. 1, H334	Calculation method
Skin Sens. 1, H317	Calculation method
Muta. 2, H341	Calculation method
Carc. 1A, H350i	Regulatory data
Repr. 1B, H360	Calculation method
STOT RE 1, H372 (lungs, respiratory tract) (inhalation)	Regulatory data
Aquatic Chronic 2, H411	Calculation method

Full text of abbreviated H statements

H302	Harmful if swallowed.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H341	Suspected of causing genetic defects.
H350i	May cause cancer by inhalation.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

Acute Tox. 4	ACUTE TOXICITY - Category 4
Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
Aquatic Chronic 2	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 2
Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Carc. 2	CARCINOGENICITY - Category 2
Eye Dam. 1	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Eye Irrit. 2	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2
Muta. 2	GERM CELL MUTAGENICITY - Category 2
Repr. 1B	REPRODUCTIVE TOXICITY - Category 1B

SECTION 16: Other information

Resp. Sens. 1	RESPIRATORY SENSITISATION - Category 1
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1
STOT SE 3	SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE - Category 3

Date of issue/ Date of revision : 12/10/2022

Date of previous issue : No previous validation

Version : 1

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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 32-4

Version	:	1
Date of issue/ Date of revision	:	23/08/2022
Date of previous issue	:	No previous validation

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 32-4
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Removal of sulphur compounds from natural gas

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to UK CLP/GHS

Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Avoid release to the environment.

Response : Collect spillage.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 2: Hazards identification

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
zinc oxide	UK (GB) REACH #: UK-01-2666131289-7 REACH #: 01-2119463881-32 EC: 215-222-5 CAS: 1314-13-2 Index: 030-013-00-7	≥90	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1) **See Section 16 for the full text of the H statements declared above.**	[1]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

SECTION 4: First aid measures

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials: metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid release to the environment. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Prior to discharge the material may contain residual hydrocarbons. The material should be purged free of hydrocarbons and cooled with an inert gas before it is discharged. The material may also contain deposited carbon and should be regarded as potentially pyrophoric when hot. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. Keep the discharged material away from mineral acids to avoid the generation of hydrogen sulphide.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

Seveso Directive - Reporting thresholds

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E1	100 tonne	200 tonne

SECTION 7: Handling and storage

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
zinc oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	5 mg/m³	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	8.3 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	83 mg/kg bw/day	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
zinc oxide	Fresh water	20.6 µg/l	Sensitivity Distribution
	Fresh water sediment	235.6 mg/kg dwt	Sensitivity Distribution
	Soil	106.8 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	52 µg/l	Assessment Factors

SECTION 8: Exposure controls/personal protection

8.2 Exposure controls

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : Wear protective coveralls. For dusty tasks where dermal contact is possible a protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) may be worn

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P2 or FFP2, Associated Protection Factor (APF) = 10) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [Granular solid.]

Colour : Off-white.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : [Product does not sustain combustion.]

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not available.

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

SECTION 10: Stability and reactivity

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
KATALCO 32-4 zinc oxide	LD50 Oral LC50 Inhalation Dusts and mists LD50 Oral	Rat Rat - Male, Female Rat	>2000 mg/kg 5.7 mg/l Continuous >5000 mg/kg Single dose	- 4 hours -

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
zinc oxide	N/A	N/A	N/A	N/A	5.7

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.
Eyes : Not classified.
Respiratory : Not classified.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result
zinc oxide	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : Not classified.
Respiratory : Not classified.

SECTION 11: Toxicological information

Mutagenicity

Product/ingredient name	Test	Experiment	Result
zinc oxide	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : Not classified.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

SECTION 11: Toxicological information

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Not classified.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
zinc oxide	Acute EC50 0.83 mg/l Fresh water	Daphnia - Daphnia - Ceriodaphnia Dubnia - Neonate	48 hours
	Acute EC50 5.2 mg/l Fresh water	Micro-organism - Activated sludge - Activated sludge	3 hours
	Acute IC50 0.27 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Acute LC50 0.338 mg/l Fresh water	Fish - Trout - Oncorrhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute NOEC 0.025 mg/l Marine water	Fish - Clupea harengus - Atlantic Herring - Embryo	27 days
	Acute NOEC 0.044 mg/l Fresh water	Fish - Lowest NOEC from 7 species	5 days (minimum)
	Chronic NOEC 0.019 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Chronic NOEC 0.0078 mg/l Marine water	Algae - Algae - lowest NOEC from 12 species - Exponential growth phase	72 hours
	Chronic NOEC 0.4 mg/l Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours
	Chronic NOEC 0.037 mg/l Fresh water	Daphnia - Daphnia - Lowest NOEC from 13 invertebrate species	7 days (minimum)
	Chronic NOEC 0.056 mg/l Marine water	Daphnia - Daphnia - Lowest NOEC from 26 invertebrate	7 days (minimum)

SECTION 12: Ecological information

		species	

Conclusion/Summary : Very toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The bioaccumulative criteria are not applicable to inorganic metals

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
zinc oxide	-	-	Not readily

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

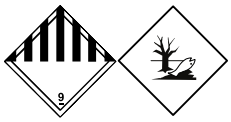
Packaging

SECTION 13: Disposal considerations

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN3077	UN3077	UN3077	UN3077
14.2 UN proper shipping name	Environmentally hazardous substance, solid, n. o.s. (zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide)
14.3 Transport hazard class (es)	9 	9 	9 	9 
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Hazard identification number 90
Limited quantity 5 kg
Special provisions 274, 335, 601, 375
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Special provisions 274, 335, 375, 601

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Emergency schedules F-A, S-F
Special provisions 274, 335, 966, 967, 969
IMDG Code Segregation group SGG7 - Heavy metals and their salts (including their organometallic compounds)

SECTION 14: Transport information

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.
Quantity limitation Passenger and Cargo Aircraft: 400 kg. Packaging instructions: 956. Cargo Aircraft Only: 400 kg. Packaging instructions: 956. Limited Quantities - Passenger Aircraft: 30 kg. Packaging instructions: Y956.
Special provisions A97, A158, A179, A197, A215

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E1

EU regulations

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Air	:	Not listed
Industrial emissions (integrated pollution prevention and control) - Water	:	Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	All components are listed or exempted.
Canada	:	All components are listed or exempted.
China	:	All components are listed or exempted.
Eurasian Economic Union	:	**Russian Federation inventory**: All components are listed or exempted.
Japan	:	**Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	All components are listed or exempted.
Turkey	:	All components are listed or exempted.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Aquatic Acute 1, H400 Aquatic Chronic 1, H410	Calculation method Calculation method

Full text of abbreviated H statements

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of classifications

Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1

Date of issue/ Date of revision : 23/08/2022

Date of previous issue : No previous validation

Version : 1

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Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 79-1

Version	:	3
Date of issue/ Date of revision	:	15/06/2023
Date of previous issue	:	16/02/2023

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 79-1
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Gas purification

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

By analogy with similar preparations this material is unlikely to be a skin sensitiser.

Product definition : Mixture

Classification according to UK CLP/GHS

Acute Tox. 4, H332
Resp. Sens. 1, H334
Skin Sens. 1, H317
Muta. 2, H341
Carc. 1A, H350i
Repr. 1B, H360D
STOT RE 2, H373 (lungs) (inhalation)
Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause an allergic skin reaction.
Harmful if inhaled.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Suspected of causing genetic defects.
May cause cancer by inhalation.
May damage the unborn child.
May cause damage to organs through prolonged or repeated exposure. (lungs) (inhalation)
Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Wear respiratory protection. Avoid release to the environment. Do not breathe dust.

Response : Collect spillage. IF exposed or concerned: Get medical advice or attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor if you feel unwell. If experiencing respiratory symptoms: Call a POISON CENTER or doctor. Take off contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

SECTION 2: Hazards identification

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
zinc oxide	UK (GB) REACH #: UK-01-2666131289-7 REACH #: 01-2119463881-32 EC: 215-222-5 CAS: 1314-13-2 Index: 030-013-00-7	≥50 - ≤75	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1]
hydrozincite	UK (GB) REACH #: UK-01-8173740625-6 REACH #: 01-2119474697-20 EC: 235-179-6 CAS: 12122-17-7	≥10 - ≤25	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 2, H411	[1]
copper(II) carbonate-copper (II) hydroxide (1:1)	UK (GB) REACH #: UK-01-0493977716-7 REACH #: 01-2119513711-50 EC: 235-113-6 CAS: 12069-69-1 Index: 029-020-00-8	≤6.6	Acute Tox. 4, H302 Acute Tox. 4, H332 Eye Irrit. 2, H319 Aquatic Acute 1, H400 (M=10) Aquatic Chronic 1, H410 (M=10)	[1] [2]
[carbonato(2-)] tetrahydroxytrinickel	REACH #: 01-2119490826-25	≤3	Acute Tox. 4, H302 Acute Tox. 2, H330	[1] [2]

SECTION 3: Composition/information on ingredients

	EC: 235-715-9 CAS: 12607-70-4 Index: 028-010-00-0		Skin Irrit. 2, H315 Eye Irrit. 2, H319 Resp. Sens. 1, H334 Skin Sens. 1, H317 Muta. 2, H341 Carc. 1A, H350i Repr. 1B, H360D STOT RE 1, H372 Aquatic Acute 1, H400 (M=10) Aquatic Chronic 1, H410 (M=10)	
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≤3	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413	[1] [2]
copper(II) oxide	UK (GB) REACH #: UK-01-0887950673-4 REACH #: 01-2119502447-44 EC: 215-269-1 CAS: 1317-38-0 Index: 029-016-00-6	≤3	Aquatic Acute 1, H400 (M=100) Aquatic Chronic 1, H410 (M=10) **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center

SECTION 4: First aid measures

or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In the event of any complaints or symptoms, avoid further exposure.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced foetal weight
increase in foetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced foetal weight
increase in foetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
reduced foetal weight
increase in foetal deaths
skeletal malformations

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitisation problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Prior to discharge the material may contain residual hydrocarbons. The material should be purged free of hydrocarbons and cooled with an inert gas before it is discharged. The material may also contain deposited carbon and should be regarded as potentially pyrophoric when hot. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

Seveso Directive - Reporting thresholds

Danger criteria

SECTION 7: Handling and storage

Category	Notification and MAPP threshold	Safety report threshold
E1	100 tonne	200 tonne

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
copper(II) carbonate-copper(II) hydroxide (1:1)	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [Copper and compounds dust and mists, as Cu]** STEL: 2 mg/m³, (as Cu) 15 minutes. Form: Dusts and Mists TWA: 1 mg/m³, (as Cu) 8 hours. Form: Dusts and Mists
[carbonato(2-)] tetrahydroxytrinickel	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
copper(II) oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [Copper and compounds dust and mists, as Cu]** STEL: 2 mg/m³, (as Cu) 15 minutes. Form: Dusts and Mists TWA: 1 mg/m³, (as Cu) 8 hours. Form: Dusts and Mists
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Type	Exposure	Value	Population	Effects
zinc oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	5 mg/m³	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	8.3 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	83 mg/kg bw/day	Workers	Systemic
hydrozincite	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
copper(II) carbonate-copper(II) hydroxide (1:1)	DNEL	Long term Dermal	137 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
[carbonato(2-)] tetrahydroxytrinickel	DNEL	Long term Dermal	0.003 mg/cm² skin	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
copper(II) oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	137 mg/kg bw/day	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
zinc oxide	Fresh water	20.6 µg/l	Sensitivity Distribution
	Fresh water sediment	235.6 mg/kg dwt	Sensitivity Distribution
	Soil	106.8 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	52 µg/l	Assessment Factors
copper(II) carbonate-copper(II) hydroxide (1:1)	Fresh water	7.8 µg/l	Assessment Factors
	Fresh water sediment	87 mg/kg dwt	Assessment Factors
	Sewage Treatment	0.23 mg/l	Assessment Factors

SECTION 8: Exposure controls/personal protection

	Plant		
	Soil	65.5 mg/kg dwt	Assessment Factors
[carbonato(2-)] tetrahydroxytrinickel	Fresh water	0.0071 mg/l	Assessment Factors
	Marine water	0.0086 mg/l	Assessment Factors
	Soil	29.9 mg/kg	Assessment Factors
	Sewage Treatment Plant	0.033 mg/l	Assessment Factors
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water sediment	109 mg/kg dwt	Assessment Factors
copper(II) oxide	Fresh water	7.8 µg/l	Assessment Factors
	Fresh water sediment	87 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.23 mg/l	Assessment Factors
	Soil	65.5 mg/kg dwt	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties.
In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

SECTION 8: Exposure controls/personal protection

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [spheres]

Colour : Green. Grey.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not applicable.

Initial boiling point and boiling range : Not applicable.

Flammability (solid, gas) : Not available.

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not applicable.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water strong acids	Very slightly soluble Partially soluble

Solubility in water : Not available.

SECTION 9: Physical and chemical properties

Partition coefficient: n-octanol/water	:	Not applicable.
Vapour pressure	:	Not available.
Relative density	:	Not available.
Bulk Density (g/ml)	:	0.8 to 1
Vapour density	:	Not applicable.
Explosive properties	:	Not available.
Oxidising properties	:	Not classified as an oxidising material
Particle characteristics		
Median particle size	:	Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
zinc oxide	LC50 Inhalation Dusts and mists	Rat - Male, Female	5.7 mg/l Continuous	4 hours
	LD50 Oral	Rat	>5000 mg/kg Single dose	-
copper(II) carbonate-copper(II) hydroxide (1:1)	LC50 Inhalation Dusts and mists	Rat	1.2 mg/l	4 hours
	LD50 Dermal	Rat - Male, Female	>2000 mg/kg	-
	LD50 Oral	Rat - Female	1291 mg/kg	-

SECTION 11: Toxicological information

	LD50 Oral	Rat - Male, Female	1385 mg/kg	-

Conclusion/Summary : Harmful by inhalation.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
KATALCO 79-1	6666.7	N/A	N/A	N/A	1.8
zinc oxide	N/A	N/A	N/A	N/A	5.7
copper(II) carbonate-copper(II) hydroxide (1:1)	500	N/A	N/A	N/A	1.2
[carbonato(2-)] tetrahydroxytrinickel	500	N/A	N/A	N/A	0.05

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result
zinc oxide	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Respiratory : Not classified.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
zinc oxide	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative

Conclusion/Summary : Suspected of causing genetic defects.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : May damage the unborn child.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

SECTION 11: Toxicological information

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 79-1 nickel monoxide [carbonato(2-)] tetrahydroxytrinickel	Category 2 Category 1 Category 1	inhalation - -	lungs - -

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Harmful if inhaled.

Skin contact : May cause an allergic skin reaction.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma
reduced foetal weight
increase in foetal deaths
skeletal malformations

Skin contact : Adverse symptoms may include the following:
irritation
redness
reduced foetal weight
increase in foetal deaths
skeletal malformations

Ingestion : Adverse symptoms may include the following:
reduced foetal weight
increase in foetal deaths
skeletal malformations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

SECTION 11: Toxicological information

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
copper(II) oxide	Chronic NOAEL Oral	Rat	16.7 mg/kg Repeated dose	-

Conclusion/Summary : May cause damage to organs through prolonged or repeated exposure if inhaled.

General : May cause damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Suspected of causing genetic defects.

Reproductive toxicity : May damage the unborn child.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
zinc oxide	Acute EC50 0.83 mg/l Fresh water	Daphnia - Daphnia - Ceriodaphnia Dubnia - Neonate	48 hours
	Acute EC50 5.2 mg/l Fresh water	Micro-organism - Activated sludge - Activated sludge	3 hours
	Acute IC50 0.27 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Acute LC50 0.338 mg/l Fresh water	Fish - Trout - Oncorrhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute NOEC 0.044 mg/l Fresh water	Fish - Lowest NOEC from 7 species	5 days (minimum)
	Chronic NOEC 0.019 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Chronic NOEC 0.0078 mg/l Marine water	Algae - Algae - lowest NOEC from 12 species - Exponential growth phase	72 hours
	Chronic NOEC 0.037 mg/l Fresh water	Daphnia - Daphnia - Lowest NOEC from 13 invertebrate species	7 days (minimum)
	Chronic NOEC 0.056 mg/l Marine water	Daphnia - Daphnia - Lowest NOEC from 26 invertebrate species	7 days (minimum)

SECTION 12: Ecological information

copper(II) carbonate-copper(II) hydroxide (1:1)	Acute LC50 25 ppb Fresh water	Daphnia - Daphnia	48 hours
	Chronic NOEC 7.8 ppb Fresh water	Algae	-
	Chronic NOEC 87 mg/kg dwt Fresh water	Crustaceans	-
	Chronic NOEC 65.5 mg/kg dwt	Micro-organism - Soil organisms	-
	Chronic NOEC 0.23 mg/l	Micro-organism - Activated sludge	-
[carbonato(2-)] tetrahydroxytrinickel	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.273 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0014 mg/l Fresh water	Crustaceans - Lymnaea stagnalis	30 days
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days
copper(II) oxide	Acute LC50 25 ppb Single dose Fresh water	Daphnia - Daphnia	48 hours
	Chronic NOEC 7.8 ppb Fresh water	Algae	-
	Chronic NOEC 87 mg/kg dwt Fresh water	Crustaceans	-
	Chronic NOEC 65.5 mg/kg dwt	Micro-organism - Soil organisms	-
	Chronic NOEC 0.23 mg/l	Micro-organism - Activated sludge	-

Conclusion/Summary : Very toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

SECTION 12: Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
zinc oxide	-	-	Not readily

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

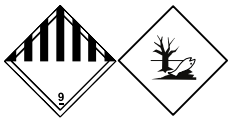
Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 13: Disposal considerations

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN3077	UN3077	UN3077	UN3077
14.2 UN proper shipping name	Environmentally hazardous substance, solid, n. o.s. (zinc oxide, copper oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide, copper oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide, copper oxide)	Environmentally hazardous substance, solid, n. o.s. (zinc oxide, copper oxide)
14.3 Transport hazard class (es)	9 	9 	9 	9 
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Hazard identification number 90
Limited quantity 5 kg
Special provisions 274, 335, 601, 375
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Special provisions 274, 335, 375, 601

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Emergency schedules F-A, S-F
Special provisions 274, 335, 966, 967, 969
IMDG Code Segregation group SGG7 - Heavy metals and their salts (including their organometallic compounds)

SECTION 14: Transport information

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.
Quantity limitation Passenger and Cargo Aircraft: 400 kg. Packaging instructions: 956. Cargo Aircraft Only: 400 kg. Packaging instructions: 956. Limited Quantities - Passenger Aircraft: 30 kg. Packaging instructions: Y956.
Special provisions A97, A158, A179, A197, A215

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E1

National regulations

SECTION 15: Regulatory information

Product/ingredient name	List name	Name on list	Classification	Notes
[carbonato(2-)] tetrahydroxytrinickel	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Japan : **Japan inventory (CSCL)**: All components are listed or exempted.
Japan inventory (ISHL): All components are listed or exempted.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : Not determined.

SECTION 15: Regulatory information

Turkey : Not determined.

United States : All components are active or exempted.

Viet Nam : All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Acute Tox. 4, H332	Calculation method
Resp. Sens. 1, H334	Calculation method
Skin Sens. 1, H317	Calculation method
Muta. 2, H341	Calculation method
Carc. 1A, H350i	On basis of test data
Repr. 1B, H360D	Calculation method
STOT RE 2, H373 (lungs) (inhalation)	On basis of test data
Aquatic Acute 1, H400	Calculation method
Aquatic Chronic 1, H410	Calculation method

Full text of abbreviated H statements

H302	Harmful if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H332	Harmful if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H341	Suspected of causing genetic defects.
H350i	May cause cancer by inhalation.
H360D	May damage the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

SECTION 16: Other information

Acute Tox. 2	ACUTE TOXICITY - Category 2
Acute Tox. 4	ACUTE TOXICITY - Category 4
Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
Aquatic Chronic 2	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 2
Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Eye Irrit. 2	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2
Muta. 2	GERM CELL MUTAGENICITY - Category 2
Repr. 1B	REPRODUCTIVE TOXICITY - Category 1B
Resp. Sens. 1	RESPIRATORY SENSITISATION - Category 1
Skin Irrit. 2	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1
STOT RE 2	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2

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Version : 3

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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 23-4HMQR

Version	:	1
Date of issue/ Date of revision	:	26/04/2023
Date of previous issue	:	No previous validation

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 23-4HMQR
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Catalyst for steam reforming of natural gas

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

By analogy with similar preparations this material is unlikely to be a skin sensitiser.

Product definition : Mixture

Classification according to UK CLP/GHS

Carc. 1A, H350i
STOT RE 1, H372 (lungs, respiratory tract) (inhalation)

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause cancer by inhalation.
Causes damage to organs through prolonged or repeated exposure. (lungs, respiratory tract) (inhalation)

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Do not breathe dust. Do not eat, drink or smoke when using this product.

Response : IF exposed or concerned: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Contains nickel powder and nickel monoxide. May produce an allergic reaction.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

SECTION 2: Hazards identification

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
aluminium oxide	REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥75 - ≤90	Not classified.	[2]
nickel powder	UK (GB) REACH #: UK-01-2823397175-4 REACH #: 01-2119438727-29 EC: 231-111-4 CAS: 7440-02-0 Index: 028-002-01-4	≥10 - ≤18	Skin Sens. 1, H317 Carc. 2, H351 (inhalation) STOT RE 1, H372 (lungs) (inhalation) Aquatic Chronic 3, H412	[1] [2]
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≤6.2	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : In case of fire toxic nickel carbonyl can be formed.

Hazardous combustion products : Decomposition products may include the following materials: metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Nitrogen blanketing is recommended when reactors have been loaded. The charging of pre-reduced materials requires particular care. Charging should be done quickly and if possible controlled from outside the vessel. Excessive vibration or disturbances should be avoided since this could cause dust to form. The material can remove oxygen from air causing a severe hazard in enclosed or confined spaces. In case of insufficient ventilation, wear suitable respiratory equipment. Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. The action of water on the reduced material may result in the evolution of small quantities of hydrogen. The reduced material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

SECTION 7: Handling and storage

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
nickel powder	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
nickel powder	DNEL	Long term Dermal	0.035 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

SECTION 8: Exposure controls/personal protection

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors
nickel powder	Fresh water	0.0071 mg/l	Assessment Factors
	Soil	29.9 mg/kg	Assessment Factors
	Sewage Treatment Plant	0.033 mg/l	Assessment Factors
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water sediment	109 mg/kg dwt	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

SECTION 8: Exposure controls/personal protection

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [4-hole pellets]

Colour : Dark grey.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

SECTION 9: Physical and chemical properties

Bulk Density (g/ml)	:	1.2
Vapour density	:	Not applicable.
Explosive properties	:	Not available.
Oxidising properties	:	Not available.
Particle characteristics		
Median particle size	:	Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

In case of fire, or under certain conditions of low temperature and high pressure in the presence of carbon monoxide, metallic nickel can form nickel carbonyl.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not classified.

Acute toxicity estimates

Not available.

Irritation/Corrosion

Conclusion/Summary

Skin	:	Not classified.
Eyes	:	Not classified.
Respiratory	:	Not classified.

Sensitisation

SECTION 11: Toxicological information

Product/ingredient name	Route of exposure	Species	Result
KATALCO 23-4HMQR	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : By analogy with similar preparations this material is unlikely to be a skin sensitiser.

Respiratory : Not classified.

Mutagenicity

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 23-4HMQR	Category 1	inhalation	lungs, respiratory tract
nickel powder	Category 1	inhalation	lungs
nickel monoxide	Category 1	-	-

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

SECTION 11: Toxicological information

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure if inhaled.

General : Causes damage to organs through prolonged or repeated exposure if inhaled.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
aluminium oxide	EC50 >100 mg/l	Daphnia - magna	48 hours
	IC50 >100 mg/l	Algae - (Selenastrum capricornutum)	72 hours
	LC50 >100 mg/l	Fish - (Trout Trotten)	96 hours
nickel powder	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0014 mg/l Fresh water	Crustaceans - Lymnaea stagnalis	30 days
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

SECTION 12: Ecological information

nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

Conclusion/Summary : Not classified.

12.2 Persistence and degradability

Conclusion/Summary : The bioaccumulative criteria are not applicable to inorganic metals

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of

SECTION 13: Disposal considerations

all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes
nickel	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Listed

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Water : Listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Japan	: **Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Thailand	: All components are listed or exempted.
Turkey	: All components are listed or exempted.
United States	: All components are active or exempted.
Viet Nam	: All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number

SECTION 16: Other information

SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Carc. 1A, H350i STOT RE 1, H372 (lungs, respiratory tract) (inhalation)	According to package According to package

Full text of abbreviated H statements

H317	May cause an allergic skin reaction.
H350i	May cause cancer by inhalation.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

Aquatic Chronic 3	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3
Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Carc. 2	CARCINOGENICITY - Category 2
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1

Date of issue/ Date of revision : 26/04/2023

Date of previous issue : No previous validation

Version : 1

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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II (including amendments) - United Kingdom (UK)

KATALCO 23-4HMQ

Version	:	2
Date of issue/ Date of revision	:	21/01/2021
Date of previous issue	:	20/02/2020

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Product identifier	:	**KATALCO™** 23-4HMQ
Product type	:	Solid.
Product definition	:	Mixture Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Catalyst for steam reforming of hydrocarbons

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

By analogy with similar preparations this material is unlikely to be a skin sensitiser.

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Carc. 1A, H350i (inhalation)
STOT RE 1, H372 (lungs) (inhalation)

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause cancer by inhalation.
Causes damage to organs through prolonged or repeated exposure if inhaled. (lungs)

Precautionary statements

Prevention : Obtain special instructions before use. Do not breathe dust. Wear protective gloves/clothing and eye/face protection.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Contains nickel monoxide. May produce an allergic reaction.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

SECTION 2: Hazards identification

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Substance/mixture : Mixture

Product/ ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
aluminium oxide	REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥75 - ≤90	Not classified.	[2]
nickel monoxide	REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≥10 - <25	Skin Sens. 1, H317 Carc. 1A, H350i (inhalation) STOT RE 1, H372 (lungs) (inhalation) Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

SECTION 4: First aid measures

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Eye contact : Dust may cause irritation to eyes.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

SECTION 5: Firefighting measures

Hazards from the substance or mixture : No specific fire or explosion hazard.

Hazardous combustion products : Decomposition products may include the following materials: metal oxide/oxides

5.3 Advice for firefighters

Special precautions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water hoses should be available to cool the material. The action of water on the material may result in the evolution of small quantities of hydrogen. The material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. Information is provided based on typical anticipated uses of the product. Additional measures might be required for bulk handling or other uses that could significantly increase worker exposure or environmental releases.

8.1 Control parameters

Occupational exposure limits

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Exposure limit values
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³ 8 hours. Form: inhalable dust TWA: 4 mg/m³ 8 hours. Form: respirable dust
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Type	Compartment Detail	Value	Method Detail
nickel monoxide	-	Fresh water	7.1 µg/l	Assessment Factors
	-	Soil	29.9 mg/kg dwt	Assessment Factors
	-	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	-	Fresh water sediment	109 mg/kg dwt	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

SECTION 8: Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties.
In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance		
Physical state	:	Solid. [4-hole pellets]
Colour	:	Grey. Green. [Light]
Odour	:	Odourless.
Odour threshold	:	Not applicable.
pH	:	Not applicable.
Melting point/freezing point	:	Not determined.
Initial boiling point and boiling range	:	Not applicable.
Flash point	:	Not applicable.
Evaporation rate (butyl acetate = 1)	:	Not applicable.
Flammability (solid, gas)	:	Not classified.
Upper/lower flammability or explosive limits	:	Not applicable.
Vapour pressure (mm Hg)	:	Not applicable.
Vapour density	:	Not applicable.
Relative density	:	Not applicable.
Bulk Density (g/ml)	:	1.2
Solubility(ies)	:	Soluble in the following materials: strong acids
Solubility - Water	:	insoluble in water.
Partition coefficient: n-octanol/water	:	Not applicable.
Auto-ignition temperature	:	Not applicable.
Decomposition temperature	:	Not available.
Viscosity (m.Pa.s)	:	Not applicable.
Explosive properties	:	Not available.
Oxidising properties	:	Not available.

9.2 Other information

No additional information.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

SECTION 10: Stability and reactivity

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
Not available.					

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitiser

Conclusion/Summary

Skin : By analogy with similar mixtures this material is unlikely to be a skin sensitiser.

Respiratory : Not classified.

Mutagenicity

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

SECTION 11: Toxicological information

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 23-4HMQ nickel monoxide	Category 1 Category 1	Inhalation Inhalation	lungs lungs

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Eye contact : Dust may cause irritation to eyes.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation : No specific data.

Ingestion : No specific data.

Skin contact : No specific data.

Eye contact : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure if inhaled.

General : Causes damage to organs through prolonged or repeated exposure if inhaled.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

SECTION 11: Toxicological information

Fertility effects : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0014 mg/l Fresh water	Crustaceans - Lymnaea stagnalis	30 days
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

Conclusion/Summary : Not classified.

12.2 Persistence and degradability

Conclusion/Summary : The bioaccumulative criteria are not applicable to essential metals.

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

European waste catalogue (EWC) : The user should assign a waste code to the material in accordance with the recommendations of the European Waste Catalogue.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user : Not applicable.

SECTION 14: Transport information

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Other EU regulations

Product/ingredient name	Carcinogenic effects	Mutagenic effects	Developmental effects	Fertility effects
nickel monoxide	Carc. 1A, H350i (inhalation)	-	-	-

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Ingredient name	List name	Status
Not listed.		

Montreal Protocol (Annexes A, B, C, E)

SECTION 15: Regulatory information

Ingredient name	Status
Not listed.	

Stockholm Convention on Persistent Organic Pollutants

Ingredient name	List name	Status
Not listed.		

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Ingredient name	List name	Status
Not listed.		

International lists

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: All components are listed or exempted.
Japan inventory (ISHL): All components are listed or exempted.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : Not determined.

Turkey : All components are listed or exempted.

United States : All components are listed or exempted.

Viet Nam : All components are listed or exempted.

15.2 Chemical safety assessment

Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Carc. 1A, H350i (inhalation)	According to package
STOT RE 1, H372 (lungs) (inhalation)	According to package

Full text of abbreviated H statements

SECTION 16: Other information

H317 H350i (inhalation) H372 (lungs) (inhalation) H413	May cause an allergic skin reaction. May cause cancer by inhalation. Causes damage to organs through prolonged or repeated exposure if inhaled. (lungs) May cause long lasting harmful effects to aquatic life.

Full text of classifications [CLP/GHS]

Aquatic Chronic 4, H413 Carc. 1A, H350i (inhalation) Skin Sens. 1, H317 STOT RE 1, H372 (lungs) (inhalation)	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4 CARCINOGENICITY (inhalation) - Category 1A SKIN SENSITISATION - Category 1 SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE (lungs) (inhalation) - Category 1

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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 23-4HQ

Version	:	3
Date of issue/ Date of revision	:	20/09/2022
Date of previous issue	:	20/09/2022

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 23-4HQ
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Catalyst for steam reforming of hydrocarbons

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

By analogy with similar preparations this material is unlikely to be a skin sensitiser.

Product definition : Mixture

Classification according to UK CLP/GHS

Carc. 1A, H350i
STOT RE 1, H372 (lungs) (inhalation)

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause cancer by inhalation.
Causes damage to organs through prolonged or repeated exposure. (lungs) (inhalation)

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Do not breathe dust. Do not eat, drink or smoke when using this product.

Response : IF exposed or concerned: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Contains nickel monoxide. May produce an allergic reaction.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

SECTION 2: Hazards identification

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
aluminium oxide	UK (GB) REACH #: UK-01-7601826488-7 REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥75 - ≤90	Not classified.	[2]
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≥10 - <25	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

SECTION 4: First aid measures

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

SECTION 5: Firefighting measures

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : No specific fire or explosion hazard.

Hazardous combustion products : Decomposition products may include the following materials: metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water hoses should be available to cool the material. The action of water on the material may result in the evolution of small quantities of hydrogen. The material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Exposure limit values
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [aluminium oxides]** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water sediment	109 mg/kg dwt	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

SECTION 8: Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [4-hole pellets]

Colour : Grey. Green. [Light]

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not available.

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

SECTION 10: Stability and reactivity

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not classified.

Acute toxicity estimates

Not available.

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

Conclusion/Summary

Skin : By analogy with similar mixtures this material is unlikely to be a skin sensitiser.

Respiratory : Not classified.

Mutagenicity

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

SECTION 11: Toxicological information

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 23-4HQ nickel monoxide	Category 1 Category 1	inhalation -	lungs -

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure if inhaled.

General : Causes damage to organs through prolonged or repeated exposure if inhaled.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

SECTION 11: Toxicological information

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
aluminium oxide	EC50 >100 mg/l	Daphnia - magna	48 hours
	IC50 >100 mg/l	Algae - (Selenastrum capricornutum)	72 hours
	LC50 >100 mg/l	Fish - (Trout Trotten)	96 hours
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0014 mg/l Fresh water	Crustaceans - Lymnaea stagnalis	30 days
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

Conclusion/Summary : Not classified.

12.2 Persistence and degradability

Conclusion/Summary : The bioaccumulative criteria are not applicable to inorganic metals

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

SECTION 14: Transport information

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Air	:	Not listed
Industrial emissions (integrated pollution prevention and control) - Water	:	Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	All components are listed or exempted.
Canada	:	All components are listed or exempted.
China	:	All components are listed or exempted.
Eurasian Economic Union	:	**Russian Federation inventory**: All components are listed or exempted.
Japan	:	**Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	All components are listed or exempted.
Turkey	:	All components are listed or exempted.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Carc. 1A, H350i STOT RE 1, H372 (lungs) (inhalation)	According to package According to package

Full text of abbreviated H statements

H317	May cause an allergic skin reaction.
H350i	May cause cancer by inhalation.
H372	Causes damage to organs through prolonged or repeated exposure.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1

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Version : 3

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SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 28-4Q

Version	:	2
Date of issue/ Date of revision	:	31/10/2023
Date of previous issue	:	15/12/2022

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 28-4Q
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Catalyst for steam reforming of hydrocarbons

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to UK CLP/GHS

Skin Sens. 1, H317
Carc. 1A, H350i
STOT RE 1, H372 (lungs) (inhalation)

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause an allergic skin reaction.
May cause cancer by inhalation.
Causes damage to organs through prolonged or repeated exposure. (lungs) (inhalation)

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Do not breathe dust. Do not eat, drink or smoke when using this product.

Response : IF exposed or concerned: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

SECTION 2: Hazards identification

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

: Mixture

Product/ingredient name	Identifiers	%	Classification	Type
aluminium oxide	UK (GB) REACH #: UK-01-7601826488-7 REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥75 - ≤90	Not classified.	[2]
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≥10 - <25	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

SECTION 4: First aid measures

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : No specific fire or explosion hazard.

Hazardous combustion products : Decomposition products may include the following materials: metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water hoses should be available to cool the material. The action of water on the material may result in the evolution of small quantities of hydrogen. The material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

SECTION 7: Handling and storage

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [aluminium oxides inhalable dust/respirable dust]** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water sediment	109 mg/kg dwt	Assessment Factors

SECTION 8: Exposure controls/personal protection

8.2 Exposure controls

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

SECTION 8: Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [4-hole pellets]

Colour : Grey.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not classified as an oxidising material

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not classified.

Acute toxicity estimates

Not available.

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Respiratory : Not classified.

Mutagenicity

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

SECTION 11: Toxicological information

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 28-4Q nickel monoxide	Category 1 Category 1	inhalation -	lungs -

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : May cause an allergic skin reaction.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

SECTION 11: Toxicological information

Conclusion/Summary : Causes damage to organs through prolonged or repeated exposure if inhaled.

General : Causes damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : May cause cancer by inhalation.
Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
aluminium oxide	EC50 >100 mg/l	Daphnia - *magna*	48 hours
	IC50 >100 mg/l	Algae - *(Selenastrum capricornutum)*	72 hours
	LC50 >100 mg/l	Fish - *(Trout Trotten)*	96 hours
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - *Chlamydomonas Sp.*	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - *Ankistrodesmus falcatus*	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - *Activated sludge*	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - *Ceriodaphnia dubia*	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - *Pimephales promelas*	96 hours
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - *Scenedesmus accuminatus*	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - *Brachydanio rerio*	8 days

Conclusion/Summary : Not classified.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

SECTION 12: Ecological information

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : The classification of the product may meet the criteria for a hazardous waste.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-

SECTION 14: Transport information

14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user : Not applicable

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Product/ingredient name	%	Designation [Usage]
KATALCO 28-4 Series nickel monoxide	≥90 ≥10 - <25	28 28

Labelling : Restricted to professional users.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

SECTION 15: Regulatory information

Product/ingredient name	List name	Name on list	Classification	Notes
nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Japan : **Japan inventory (CSCL)**: All components are listed or exempted.
Japan inventory (ISHL): All components are listed or exempted.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : All components are listed or exempted.

Turkey : All components are listed or exempted.

United States : All components are active or exempted.

Viet Nam : All components are listed or exempted.

15.2 Chemical safety assessment : Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.

SECTION 15: Regulatory information

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 (lungs) (inhalation)	Calculation method According to package According to package

Full text of abbreviated H statements

H317	May cause an allergic skin reaction.
H350i	May cause cancer by inhalation.
H372	Causes damage to organs through prolonged or repeated exposure.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1

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Version : 2

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SECTION 16: Other information

Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 83-5

Version	:	2
Date of issue/ Date of revision	:	23/05/2023
Date of previous issue	:	15/08/2022

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 83-5
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Medium temperature shift conversion

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to UK CLP/GHS

Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Avoid release to the environment.

Response : Collect spillage.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 2: Hazards identification

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
copper(II) oxide	UK (GB) REACH #: UK-01-0887950673-4 REACH #: 01-2119502447-44 EC: 215-269-1 CAS: 1317-38-0 Index: 029-016-00-6	≥25 - ≤50	Aquatic Acute 1, H400 (M=100) Aquatic Chronic 1, H410 (M=10)	[1] [2]
zinc oxide	UK (GB) REACH #: UK-01-2666131289-7 REACH #: 01-2119463881-32 EC: 215-222-5 CAS: 1314-13-2 Index: 030-013-00-7	≥25 - ≤50	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1]
aluminium oxide	UK (GB) REACH #: UK-01-7601826488-7 REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥10 - ≤25	Not classified.	[2]
Natural graphite	REACH #: 01-2119486977-12 EC: 231-955-3 CAS: 7782-42-5	≤3	Not classified. **See Section 16 for the full text of the H statements declared above.**	[2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing.

SECTION 4: First aid measures

Skin contact : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Non-flammable. Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid release to the environment. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. The action of water on the reduced material may result in the evolution of small quantities of hydrogen.

SECTION 7: Handling and storage

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

Seveso Directive - Reporting thresholds

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E1	100 tonne	200 tonne

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
copper(II) oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [Copper and compounds dust and mists, as Cu]** STEL: 2 mg/m³, (as Cu) 15 minutes. Form: Dusts and Mists TWA: 1 mg/m³, (as Cu) 8 hours. Form: Dusts and Mists
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [aluminium oxides inhalable dust/respirable dust]** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
Natural graphite	**EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

SECTION 8: Exposure controls/personal protection

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
copper(II) oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	137 mg/kg bw/day	Workers	Systemic
zinc oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	5 mg/m³	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	8.3 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	83 mg/kg bw/day	Workers	Systemic
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
Natural graphite	DNEL	Long term Inhalation	1.2 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	1.2 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
copper(II) oxide	Fresh water	7.8 µg/l	Assessment Factors
	Fresh water sediment	87 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.23 mg/l	Assessment Factors
	Soil	65.5 mg/kg dwt	Assessment Factors
zinc oxide	Fresh water	20.6 µg/l	Sensitivity Distribution
	Fresh water sediment	235.6 mg/kg dwt	Sensitivity Distribution
	Soil	106.8 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	52 µg/l	Assessment Factors
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors

8.2 Exposure controls

SECTION 8: Exposure controls/personal protection

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : Wear protective coveralls. For dusty tasks where dermal contact is possible a protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) may be worn

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P2 or FFP2, Associated Protection Factor (APF) = 10) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [Pellets.]

Colour : Brown. [Dark]

Odour : Not available.

Odour threshold : Not available.

Melting point/freezing point : Not applicable.

Initial boiling point and boiling range : Not applicable.

Flammability (solid, gas) : Non-flammable. Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : [Product does not sustain combustion.]

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not applicable.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : 0 g/l

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Bulk Density (g/ml) : 1.35 - 1.45

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not classified as an oxidising material

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
zinc oxide	LC50 Inhalation Dusts and mists LD50 Oral	Rat - Male, Female Rat	5.7 mg/l Continuous >5000 mg/kg Single dose	4 hours -

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
zinc oxide	N/A	N/A	N/A	N/A	5.7

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

SECTION 11: Toxicological information

Product/ingredient name	Route of exposure	Species	Result
zinc oxide	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : Not classified.

Respiratory : Not classified.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
zinc oxide	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : Not classified.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

SECTION 11: Toxicological information

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
copper(II) oxide	Chronic NOAEL Oral	Rat	16.7 mg/kg Repeated dose	-

Conclusion/Summary : Not classified.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
copper(II) oxide	Acute LC50 25 ppb Single dose Fresh water	Daphnia - Daphnia	48 hours
	Chronic NOEC 7.8 ppb Fresh water	Algae	-
	Chronic NOEC 87 mg/kg dwt Fresh water	Crustaceans	-
	Chronic NOEC 65.5 mg/kg dwt	Micro-organism - Soil organisms	-
	Chronic NOEC 0.23 mg/l	Micro-organism - Activated sludge	-
zinc oxide	Acute EC50 0.83 mg/l Fresh water	Daphnia - Daphnia - Ceriodaphnia Dubnia - Neonate	48 hours
	Acute EC50 5.2 mg/l Fresh water	Micro-organism - Activated sludge - Activated sludge	3 hours
	Acute IC50 0.27 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours

SECTION 12: Ecological information

	Acute LC50 0.338 mg/l Fresh water	Fish - Trout - Oncorrhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute NOEC 0.044 mg/l Fresh water	Fish - Lowest NOEC from 7 species	5 days (minimum)
	Chronic NOEC 0.019 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Chronic NOEC 0.0078 mg/l Marine water	Algae - Algae - lowest NOEC from 12 species - Exponential growth phase	72 hours
	Chronic NOEC 0.037 mg/l Fresh water	Daphnia - Daphnia - Lowest NOEC from 13 invertebrate species	7 days (minimum)
	Chronic NOEC 0.056 mg/l Marine water	Daphnia - Daphnia - Lowest NOEC from 26 invertebrate species	7 days (minimum)
aluminium oxide	EC50 >100 mg/l	Daphnia - magna	48 hours
	IC50 >100 mg/l	Algae - (Selenastrum capricornutum)	72 hours
	LC50 >100 mg/l	Fish - (Trout Trotten)	96 hours

Conclusion/Summary : Very toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
zinc oxide	-	-	Not readily

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : Yes.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Waste catalogue

Waste code	Waste designation
06 03 15* 16 03 03*	metallic oxides containing heavy metals inorganic wastes containing hazardous substances

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN3077	UN3077	UN3077	UN3077
14.2 UN proper shipping name	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)
14.3 Transport hazard class (es)	9 	9 	9 	9 

SECTION 14: Transport information

14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Hazard identification number 90
Limited quantity 5 kg
Special provisions 274, 335, 601, 375
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Special provisions 274, 335, 375, 601

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Emergency schedules F-A, S-F
Special provisions 274, 335, 966, 967, 969
IMDG Code Segregation group SGG7 - Heavy metals and their salts (including their organometallic compounds)

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.
Quantity limitation Passenger and Cargo Aircraft: 400 kg. Packaging instructions: 956. Cargo Aircraft Only: 400 kg. Packaging instructions: 956. Limited Quantities - Passenger Aircraft: 30 kg. Packaging instructions: Y956.
Special provisions A97, A158, A179, A197, A215

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

SECTION 15: Regulatory information

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E1

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

SECTION 15: Regulatory information

Japan	:	**Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	All components are listed or exempted.
Turkey	:	All components are listed or exempted.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Aquatic Acute 1, H400 Aquatic Chronic 1, H410	Calculation method Calculation method

Full text of abbreviated H statements

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of classifications

Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1

Date of issue/ Date of revision : 23/05/2023

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Version : 2

Notice to reader

SECTION 16: Other information

Information in this publication is believed to be accurate and is given in good faith, but it is for the Customer to satisfy itself of the suitability for its own particular purpose. Accordingly, Johnson Matthey gives no warranty as to the fitness of the Product for any particular purpose and any implied warranty or condition (statutory or otherwise) is excluded except to the extent that such exclusion is prevented by law. Freedom under Patent, Copyright and Designs cannot be assumed.
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Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 89-9GQ

Version	:	1
Date of issue/ Date of revision	:	05/04/2023
Date of previous issue	:	No previous validation

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 89-9GQ
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Catalyst for steam reforming of hydrocarbons

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

By analogy with similar mixtures this material is unlikely to be a skin sensitiser.

Product definition : Mixture

Classification according to UK CLP/GHS

Skin Sens. 1, H317
Carc. 1A, H350i
STOT RE 2, H373 (lungs) (inhalation)

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : May cause an allergic skin reaction.
May cause cancer by inhalation.
May cause damage to organs through prolonged or repeated exposure. (lungs) (inhalation)

Precautionary statements

Prevention : Obtain special instructions before use. Wear protective gloves, protective clothing, eye protection, face protection, or hearing protection. Do not breathe dust.

Response : IF exposed or concerned: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice or attention.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

SECTION 2: Hazards identification

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
Yttrium zirconium oxide	EC: 264-885-7 CAS: 64417-98-7	≥90	Not classified.	[2]
nickel monoxide	UK (GB) REACH #: UK-01-9673611790-2 REACH #: 01-2119467172-41 EC: 215-215-7 CAS: 1313-99-1 Index: 028-003-00-2	≤10	Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 1, H372 Aquatic Chronic 4, H413 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

SECTION 4: First aid measures

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. In the event of any complaints or symptoms, avoid further exposure. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
metal oxide/oxides

SECTION 5: Firefighting measures

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not ingest. Avoid release to the environment. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : The reduced material should not be exposed to gases containing carbon monoxide at temperatures between 50 deg C and 200 deg C because of the danger of formation of nickel carbonyl under these conditions. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. The action of water on the reduced material may result in the evolution of small quantities of hydrogen. Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Exposure limit values
Yttrium zirconium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [zirconium compounds as Zr]** STEL: 10 mg/m³, (as Zr) 15 minutes. TWA: 5 mg/m³, (as Zr) 8 hours.
nickel monoxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)] Absorbed through skin. Inhalation sensitiser.** TWA: 0.5 mg/m³, (as Ni) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.
Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
nickel monoxide	DNEL	Long term Dermal	0.012 mg/cm²	Workers	Local
	DNEL	Long term Inhalation	0.05 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
nickel monoxide	Fresh water	7.1 µg/l	Assessment Factors
	Soil	29.9 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.33 mg/l	Assessment Factors
	Fresh water sediment	109 mg/kg dwt	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

SECTION 8: Exposure controls/personal protection

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : A protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) should be worn during loading and unloading or reactors, sampling and cleaning and maintenance operations where dermal contact is possible.

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P3 or FFP3, Associated Protection Factor (APF) = 20) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [4-hole pellets]

Colour : Grey.

Odour : Odourless.

Odour threshold : Not available.

SECTION 9: Physical and chemical properties

Melting point/freezing point : Not applicable.

Initial boiling point and boiling range : Not applicable.

Flammability (solid, gas) : Not available.

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not applicable.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water strong acids	Not soluble Partially soluble

Solubility in water : 0 g/l

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Density : 1.5 g/cm³

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not classified as an oxidising material

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

SECTION 10: Stability and reactivity

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Yttrium zirconium oxide	LD50 Oral	Rat - Male, Female	>2000 mg/kg	-

Conclusion/Summary : Not classified.

Acute toxicity estimates

Not available.

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result
KATALCO 89-9GQ	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : May cause an allergic skin reaction.

Respiratory : Not classified.

Mutagenicity

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : May cause cancer by inhalation.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

SECTION 11: Toxicological information

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
KATALCO 89-9GQ nickel monoxide	Category 2 Category 1	inhalation -	lungs -

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : May cause an allergic skin reaction.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : May cause damage to organs through prolonged or repeated exposure if inhaled.

General : May cause damage to organs through prolonged or repeated exposure if inhaled. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : May cause cancer by inhalation. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

SECTION 11: Toxicological information

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
nickel monoxide	Acute EC50 0.0588 mg/l Fresh water	Algae - Chlamydomonas Sp.	72 hours
	Acute EC50 0.237 mg/l Fresh water	Aquatic plants - Ankistrodesmus falcatus	72 hours
	Acute EC50 33 mg/l Fresh water	Micro-organism - Activated sludge	30 minutes
	Acute LC50 0.013 mg/l Fresh water	Crustaceans - Ceriodaphnia dubia	48 hours
	Acute LC50 0.4 mg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 0.0123 mg/l Fresh water	Algae - Scenedesmus accuminatus	72 hours
	Chronic NOEC 0.04 mg/l Fresh water	Fish - Brachydanio rerio	8 days

Conclusion/Summary : Not classified.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : Yes.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Waste catalogue

Waste code	Waste designation
06 03 15* 06 04 05*	metallic oxides containing heavy metals wastes containing other heavy metals

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-
14.4 Packing group	-	-	-	-

SECTION 14: Transport information

14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Restricted to professional users.

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes

SECTION 15: Regulatory information

nickel monoxide	UK Occupational Exposure Limits EH40 - WEL	nickel and its inorganic compounds, water-insoluble (except nickel tetracarbonyl) (as Ni)	Carc.	-

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : Not determined.

Canada : At least one component is not listed in DSL but all such components are listed in NDSL.

China : Not determined.

Japan : **Japan inventory (CSCL)**: All components are listed or exempted.
Japan inventory (ISHL): All components are listed or exempted.

New Zealand : Not determined.

Philippines : Not determined.

Republic of Korea : All components are listed or exempted.

Taiwan : Not determined.

Thailand : Not determined.

Turkey : Not determined.

United States : Not determined.

Viet Nam : All components are listed or exempted.

15.2 Chemical safety assessment : Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Skin Sens. 1, H317 Carc. 1A, H350i STOT RE 2, H373 (lungs) (inhalation)	Calculation method Expert judgment Expert judgment

Full text of abbreviated H statements

H317	May cause an allergic skin reaction.
H350i	May cause cancer by inhalation.
H372	Causes damage to organs through prolonged or repeated exposure.
H373	May cause damage to organs through prolonged or repeated exposure.
H413	May cause long lasting harmful effects to aquatic life.

Full text of classifications

Aquatic Chronic 4	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 4
Carc. 1A	CARCINOGENICITY - Category 1A
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1
STOT RE 2	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2

Date of issue/ Date of revision : 05/04/2023

Date of previous issue : No previous validation

Version : 1

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SECTION 16: Other information

Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 83-3X

Version	:	1
Date of issue/ Date of revision	:	13/10/2022
Date of previous issue	:	No previous validation

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 83-3X
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Low temperature shift conversion

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+44 (0) 870 8200418 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to UK CLP/GHS

Aquatic Acute 1, H400
Aquatic Chronic 1, H410

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Very toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention : Avoid release to the environment.

Response : Collect spillage.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 2: Hazards identification

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
copper(II) oxide	UK (GB) REACH #: UK-01-0887950673-4 REACH #: 01-2119502447-44 EC: 215-269-1 CAS: 1317-38-0 Index: 029-016-00-6	≥25 - ≤50	Aquatic Acute 1, H400 (M=100) Aquatic Chronic 1, H410 (M=10)	[1] [2]
zinc oxide	UK (GB) REACH #: UK-01-2666131289-7 REACH #: 01-2119463881-32 EC: 215-222-5 CAS: 1314-13-2 Index: 030-013-00-7	≥25 - ≤50	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1]
aluminium oxide	UK (GB) REACH #: UK-01-7601826488-7 REACH #: 01-2119529248-35 EC: 215-691-6 CAS: 1344-28-1	≥10 - ≤25	Not classified.	[2]
Natural graphite	REACH #: 01-2119486977-12 EC: 231-955-3 CAS: 7782-42-5	≤3	Not classified.	[2]
caesium carbonate	EC: 208-591-9 CAS: 534-17-8	<1	Eye Dam. 1, H318 Repr. 2, H361fd (oral) STOT RE 2, H373 (adrenal, kidneys) (oral) **See Section 16 for the full text of the H statements declared above.**	[1]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

SECTION 5: Firefighting measures

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : Discharged material may be pyrophoric (see Process Hazards).

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

6.3 Methods and material for containment and cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid release to the environment. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

SECTION 7: Handling and storage

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Process hazards : Following activation in a reducing environment the material should be regarded as pyrophoric. Pyrophoric and self-heating materials can act as sources of ignition and should be kept away from combustible materials. As a minimum, water sprays should be available to cool the material. The action of water on the reduced material may result in the evolution of small quantities of hydrogen. Keep the discharged material away from mineral acids to avoid the generation of hydrogen sulphide.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

Seveso Directive - Reporting thresholds

Danger criteria

Category	Notification and MAPP threshold	Safety report threshold
E1	100 tonne	200 tonne

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
copper(II) oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [Copper and compounds]** STEL: 2 mg/m³, (as Cu) 15 minutes. Form: Dusts and Mists TWA: 1 mg/m³, (as Cu) 8 hours. Form: Dusts and Mists
aluminium oxide	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [aluminium oxides]** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust
Natural graphite	**EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³ 8 hours. Form: respirable dust TWA: 10 mg/m³ 8 hours. Form: inhalable dust

SECTION 8: Exposure controls/personal protection

Respirable dust	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.
Inhalable fraction	***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
copper(II) oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	137 mg/kg bw/day	Workers	Systemic
zinc oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	5 mg/m³	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	8.3 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	83 mg/kg bw/day	Workers	Systemic
aluminium oxide	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	15.63 mg/m³	Workers	Local
Natural graphite	DNEL	Long term Inhalation	1.2 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	1.2 mg/m³	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
copper(II) oxide	Fresh water	7.8 µg/l	Assessment Factors
	Fresh water sediment	87 mg/kg dwt	Assessment Factors
	Sewage Treatment Plant	0.23 mg/l	Assessment Factors
	Soil	65.5 mg/kg dwt	Assessment Factors
zinc oxide	Fresh water	20.6 µg/l	Sensitivity Distribution

SECTION 8: Exposure controls/personal protection

	Fresh water sediment	235.6 mg/kg dwt	Sensitivity Distribution
	Soil	106.8 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	52 µg/l	Assessment Factors
aluminium oxide	Sewage Treatment Plant	20 mg/l	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : Wear protective coveralls. For dusty tasks where dermal contact is possible a protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) may be worn

SECTION 8: Exposure controls/personal protection

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P2 or FFP2, Associated Protection Factor (APF) = 10) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [Pellets.]

Colour : Brown. [Dark]

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not available.

Initial boiling point and boiling range : Not available.

Flammability (solid, gas) : Discharged material may be pyrophoric (see Process Hazards).

Upper/lower flammability or explosive limits : Not applicable.

Flash point : Not applicable.

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water	Not soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Bulk Density (g/ml) : 1.3 - 1.6

Vapour density : Not applicable.

Explosive properties : Not available.

SECTION 9: Physical and chemical properties

Oxidising properties : Not available.

Particle characteristics

Median particle size : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

See Process Hazards section for hazards associated with the discharged material resulting from its intended use.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
zinc oxide	LC50 Inhalation Dusts and mists LD50 Oral	Rat - Male, Female Rat	5.7 mg/l Continuous >5000 mg/kg Single dose	4 hours -
caesium carbonate	LD50 Oral	Rat	2333 mg/kg	-

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
zinc oxide caesium carbonate	N/A 2333	N/A N/A	N/A N/A	N/A N/A	5.7 N/A

SECTION 11: Toxicological information

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
caesium carbonate	Eyes - Cornea opacity	Mammal - species unspecified	183	4 hours 20% concentration	-

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result
zinc oxide	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : Not classified.

Respiratory : Not classified.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
zinc oxide	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : Not classified.

Reproductive toxicity

Conclusion/Summary : Not classified.
Suspected of damaging fertility or the unborn child. (China, Taiwan, United States, Canada, UN GHS Classification)

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
caesium carbonate	Category 2	oral	adrenal, kidneys

SECTION 11: Toxicological information

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.

Skin contact : Repeated or prolonged skin contact may cause irritation. May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not applicable

Potential delayed effects : Not applicable

Long term exposure

Potential immediate effects : Not applicable

Potential delayed effects : Not applicable

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
copper(II) oxide	Chronic NOAEL Oral	Rat	16.7 mg/kg Repeated dose	-

Conclusion/Summary : Not classified.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
copper(II) oxide	Acute LC50 25 ppb Single dose Fresh water	Daphnia - Daphnia	48 hours
	Chronic NOEC 7.8 ppb Fresh water	Algae	-
	Chronic NOEC 87 mg/kg dwt Fresh water	Crustaceans	-
	Chronic NOEC 65.5 mg/kg dwt	Micro-organism - Soil organisms	-
	Chronic NOEC 0.23 mg/l	Micro-organism - Activated sludge	-
zinc oxide	Acute EC50 0.83 mg/l Fresh water	Daphnia - Daphnia - Ceriodaphnia Dubnia - Neonate	48 hours
	Acute EC50 5.2 mg/l Fresh water	Micro-organism - Activated sludge - Activated sludge	3 hours
	Acute IC50 0.27 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Acute LC50 0.338 mg/l Fresh water	Fish - Trout - Oncorrhynchus mykiss - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Acute NOEC 0.025 mg/l Marine water	Fish - Clupea harengus - Atlantic Herring - Embryo	27 days
	Acute NOEC 0.044 mg/l Fresh water	Fish - Lowest NOEC from 7 species	5 days (minimum)
	Chronic NOEC 0.019 mg/l Fresh water	Algae - Algae - Pseudokirchnerella subcapitata - Exponential growth phase	72 hours
	Chronic NOEC 0.0078 mg/l Marine water	Algae - Algae - lowest NOEC from 12 species - Exponential growth phase	72 hours
	Chronic NOEC 0.4 mg/l Fresh water	Daphnia - Water flea - Daphnia magna - Neonate	48 hours
	Chronic NOEC 0.037 mg/l Fresh water	Daphnia - Daphnia - Lowest NOEC from 13 invertebrate species	7 days (minimum)
	Chronic NOEC 0.056 mg/l Marine water	Daphnia - Daphnia - Lowest NOEC from 26 invertebrate species	7 days (minimum)
aluminium oxide	EC50 >100 mg/l	Daphnia - magna	48 hours
	IC50 >100 mg/l	Algae - (Selenastrum capricornutum)	72 hours
	LC50 >100 mg/l	Fish - (Trout Trotten)	96 hours

Conclusion/Summary : Very toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

SECTION 12: Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
zinc oxide	-	-	Not readily

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Dispose of through the metal recovery industry.

Hazardous waste : Yes.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Waste catalogue

Waste code	Waste designation
16 08 02*	spent catalysts containing hazardous transition metals or hazardous transition metal compounds

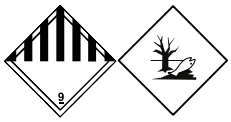
Packaging

SECTION 13: Disposal considerations

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN3077	UN3077	UN3077	UN3077
14.2 UN proper shipping name	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)	Environmentally hazardous substance, solid, n. o.s. (copper oxide, zinc oxide)
14.3 Transport hazard class (es)	9 	9 	9 	9 
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	Yes.	Yes.	Yes.	Yes.

Additional information

ADR/RID : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Hazard identification number 90
Limited quantity 5 kg
Special provisions 274, 335, 601, 375
Tunnel code (-)

ADN : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Special provisions 274, 335, 375, 601

IMDG : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.4 to 4.1.1.8.
Emergency schedules F-A, S-F
Special provisions 274, 335, 966, 967, 969
IMDG Code Segregation group SGG7 - Heavy metals and their salts (including their organometallic compounds)

SECTION 14: Transport information

IATA : This product is not regulated as a dangerous good when transported in sizes of ≤5 L or ≤5 kg, provided the packagings meet the general provisions of 5.0.2.4.1, 5.0.2.6.1.1 and 5.0.2.8.
Quantity limitation Passenger and Cargo Aircraft: 400 kg. Packaging instructions: 956. Cargo Aircraft Only: 400 kg. Packaging instructions: 956. Limited Quantities - Passenger Aircraft: 30 kg. Packaging instructions: Y956.
Special provisions A97, A158, A179, A197, A215

14.6 Special precautions for user : Not applicable.

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
E1

EU regulations

SECTION 15: Regulatory information

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	: All components are listed or exempted.
Canada	: All components are listed or exempted.
China	: All components are listed or exempted.
Eurasian Economic Union	: **Russian Federation inventory**: Not determined.
Japan	: **Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Thailand	: Not determined.
Turkey	: Not determined.
United States	: All components are active or exempted.
Viet Nam	: All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Aquatic Acute 1, H400 Aquatic Chronic 1, H410	Calculation method Calculation method

Full text of abbreviated H statements

H318	Causes serious eye damage.
H361fd	Suspected of damaging fertility. Suspected of damaging the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of classifications

Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
Eye Dam. 1	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Repr. 2	REPRODUCTIVE TOXICITY - Category 2
STOT RE 2	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2

Date of issue/ Date of revision : 13/10/2022

Date of previous issue : No previous validation

Version : 1

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Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by UK REACH Regulation SI 2019/758

KATALCO 59-4

Version	:	2
Date of issue/ Date of revision	:	20/05/2024
Date of previous issue	:	20/12/2022

Section 1. Chemical product and company identification

1.1 Product identifier

Product name	:	**KATALCO™** 59-4
Product type	:	Solid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Specific uses	:	Chloride removal

1.3 Details of the supplier of the safety data sheet

Supplier	:	Johnson Matthey PO Box No 1,Belasis Avenue, Billingham, Stockton on Tees, TS23 1LB, UK +44 (0) 1642 523343
e-mail address of person responsible for this SDS	:	jmsds1@matthey.com

1.4 Emergency telephone number

For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call :

Emergency telephone number (with hours of operation)	:	+(44) 20 3807 3798 CHEMTREC UK (London)	(24 hours)
		+(1) 703-527-3887 CHEMTREC International	(24 hours)
Country information	:	000-800-100-7141 CHEMTREC India (local)	(24 hours)
Information limitations	:	For emergency calls only. Non-emergency calls cannot be serviced at this number.	
CHEMTREC Customer Number (CCN)	:	CCN12026	

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

This product contains Silica, crystalline (quartz, airborne particles of respirable size) below 1% w/w. Respirable crystalline silica in the form of quartz or cristobalite is classified as a STOT RE1 under GHS the threshold for this is 1%, below 1% there is no impact on the product classification.
However, any relevant OELs for respirable crystalline silica are shown in section 8 of the SDS.

Product definition : Mixture

Classification according to UK CLP/GHS
Aquatic Chronic 3, H412

The product is classified as hazardous according to UK CLP Regulation SI 2019/720 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Signal word : No signal word.

Hazard statements : Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention : Avoid release to the environment.

Response : Not applicable.

Storage : Not applicable.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII : This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

Other hazards which do not result in classification : None known.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	%	Classification	Type
zinc oxide	UK (GB) REACH #: UK-01-2666131289-7 REACH #: 01-2119463881-32 EC: 215-222-5 CAS: 1314-13-2 Index: 030-013-00-7	<2.5	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1]
crystalline silica, respirable powder	EC: 238-878-4 CAS: 14808-60-7	<1	STOT RE 1, H372 (lungs) (inhalation) **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Do not induce vomiting unless directed to do so by medical personnel.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

SECTION 4: First aid measures

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

5.3 Advice for firefighters

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

6.3 Methods and material for containment and cleaning up

SECTION 6: Accidental release measures

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid release to the environment. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a dry place. Keep only in the original container. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Store away from incompatible materials (see Section 10). See Section 10 for incompatible materials before handling or use.

Additional information : Further advice given in the Johnson Matthey publication 'Catalyst Handling'.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
crystalline silica, respirable powder Inhalable fraction Respirable dust	**EH40/2005 WELs (United Kingdom (UK), 1/2020). [silica, respirable crystalline]** TWA: 0.1 mg/m³ 8 hours. Form: Respirable fraction ***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 10 mg/m³, (Inhalable) 8 hours. ***[Air contaminant]*** **EH40/2005 WELs (United Kingdom (UK), 1/2020).** TWA: 4 mg/m³, (Respirable fraction) 8 hours.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
zinc oxide	DNEL	Long term Inhalation	1 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	5 mg/m³	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Oral	0.83 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	8.3 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Dermal	83 mg/kg bw/day	Workers	Systemic

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
zinc oxide	Fresh water	20.6 µg/l	Sensitivity Distribution
	Fresh water sediment	235.6 mg/kg dwt	Sensitivity Distribution
	Soil	106.8 mg/kg dwt	Sensitivity Distribution
	Sewage Treatment Plant	52 µg/l	Assessment Factors

8.2 Exposure controls

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

SECTION 8: Exposure controls/personal protection

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

General information : All personal protective equipment (PPE) should be selected and used under the direction of a trained health and safety professional. PPE should be in compliance with any relevant local or national standard. Where no local or national standards apply, compliance with the relevant EU standard is recommended.
It remains the responsibility of the user to ensure that this product is used safely within the context of their site conditions.

Eye/face protection : Safety eyewear complying with an approved standard (EN 166 or local equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust, powder or liquid splashes is possible.

Skin protection

Hand protection : Chemical/bio-chemical resistant, impervious gloves complying with an approved chemical standard (EN 374 or local equivalent) should be worn at all times when handling chemical products. For tasks involving physical or mechanical hazards, gloves should also comply with an approved physical standard (EN 388 or local equivalent).
Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Safety shoes complying with an approved standard (EN 20346 or equivalent) and a hard hat complying with an approved standard (EN 297 or equivalent) is required during loading and unloading of reactors, cleaning and maintenance operations and sampling.

Other skin protection : Wear protective coveralls. For dusty tasks where dermal contact is possible a protective suit complying with an approved standard (EN 13982-1 Type 5 or equivalent) may be worn

Respiratory protection : Use of Respiratory Protective Equipment (RPE) (Particle filter with high efficiency for solid particles (EN 143 or 149, Type P2 or FFP2, Associated Protection Factor (APF) = 10) or local equivalent as a minimum) is required during loading and unloading of reactors, cleaning and maintenance operations, and sampling, where exposure to dust or powder is possible. Air-fed Respiratory Protective Equipment may be used if entry to the reactor is required.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Solid. [spheres]

Colour : Off-white.

Odour : Odourless.

Odour threshold : Not available.

Melting point/freezing point : Not applicable.

Initial boiling point and boiling range : Not applicable.

Flammability (solid, gas) : Not available.

Upper/lower flammability or explosive limits : Not applicable.

Flash point : [Product does not sustain combustion.]

Auto-ignition temperature : Not applicable.

Decomposition temperature : Not available.

pH : Not available.

Viscosity : Not applicable.

Solubility(ies) :

Media	Result
cold water strong acids	Partially soluble Partially soluble

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not applicable.

Vapour pressure : Not available.

Relative density : Not available.

Bulk Density (g/ml) : 0.9 to 1

Vapour density : Not applicable.

Explosive properties : Not available.

Oxidising properties : Not classified as an oxidising material

Particle characteristics

Median particle size : Not available.

Percentage of particles with aerodynamic diameter ≤ 10 µm : 0

SECTION 10: Stability and reactivity

10.1 Reactivity

No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid

No specific data.

10.5 Incompatible materials

No specific data.

10.6 Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
zinc oxide	LC50 Inhalation Dusts and mists LD50 Oral	Rat - Male, Female Rat	5.7 mg/l Continuous >5000 mg/kg Single dose	4 hours -

Conclusion/Summary : Not classified.

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapours) (mg/l)	Inhalation (dusts and mists) (mg/l)
zinc oxide	N/A	N/A	N/A	N/A	5.7

Irritation/Corrosion

Conclusion/Summary

Skin : Not classified.

Eyes : Not classified.

Respiratory : Not classified.

Sensitisation

SECTION 11: Toxicological information

Product/ingredient name	Route of exposure	Species	Result
zinc oxide	skin	Guinea pig	Not sensitizing

Conclusion/Summary

Skin : Not classified.

Respiratory : Not classified.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
zinc oxide	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative

Conclusion/Summary : Not classified.

Carcinogenicity

Conclusion/Summary : Not classified.

Reproductive toxicity

Conclusion/Summary : Not classified.

Teratogenicity

Conclusion/Summary : Not classified.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
crystalline silica, respirable powder	Category 1	inhalation	lungs

Aspiration hazard

Not applicable.

Information on likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation, Eyes.

Potential acute health effects

Eye contact : Dust may cause irritation to eyes.

Inhalation : Unlikely to be hazardous by inhalation unless present as a dust. High concentrations of dust may be irritant to the upper respiratory tract. Dust may enter the lung and be slow to clear.
In the metals industry, high concentrations of very finely divided dust containing copper and/or zinc compounds have been known to produce the symptoms of metal fume fever. This condition is characterised by influenza type symptoms occurring a few hours after exposure and lasting for up to 48 hours. However, the handling and use of this product

SECTION 11: Toxicological information

in line with Section 7 is not expected to pose such a risk.

Skin contact : Repeated or prolonged skin contact may cause irritation.
May cause physical abrasion in contact with skin.

Ingestion : Ingestion may cause irritation of the gastrointestinal tract.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Not classified.

General : Repeated inhalation of crystalline silica may produce fibrosis of the lungs leading to silicosis and lung cancer.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Reproductive toxicity : No known significant effects or critical hazards.

Other information : Not available.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
zinc oxide	Acute EC50 0.83 mg/l Fresh water	Daphnia - Daphnia - *Ceriodaphnia Dubnia* - Neonate	48 hours
	Acute EC50 5.2 mg/l Fresh water	Micro-organism - Activated sludge - *Activated sludge*	3 hours
	Acute IC50 0.27 mg/l Fresh water	Algae - Algae - *Pseudokirchnerella subcapitata* - Exponential growth phase	72 hours
	Acute LC50 0.338 mg/l Fresh water	Fish - Trout - *Oncorrhynchus mykiss* - Juvenile (Fledgling,	96 hours

SECTION 12: Ecological information

		Hatchling, Weanling)	
	Acute NOEC 0.044 mg/l Fresh water	Fish - *Lowest NOEC from 7 species*	5 days (minimum)
	Chronic NOEC 0.019 mg/l Fresh water	Algae - Algae - *Pseudokirchnerella subcapitata* - Exponential growth phase	72 hours
	Chronic NOEC 0.0078 mg/l Marine water	Algae - Algae - *lowest NOEC from 12 species* - Exponential growth phase	72 hours
	Chronic NOEC 0.037 mg/l Fresh water	Daphnia - Daphnia - *Lowest NOEC from 13 invertebrate species*	7 days (minimum)
	Chronic NOEC 0.056 mg/l Marine water	Daphnia - Daphnia - *Lowest NOEC from 26 invertebrate species*	7 days (minimum)

Conclusion/Summary : Harmful to aquatic life with long lasting effects.

12.2 Persistence and degradability

Conclusion/Summary : The methods for determining the biological degradability are not applicable to inorganic substances.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
zinc oxide	-	-	Not readily

12.3 Bioaccumulative potential

Not available.

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

No known significant effects or critical hazards.

SECTION 13: Disposal considerations

Used material may have different hazards or properties from the new material. This safety data sheet does not apply to the used material.

In all cases where a EWC code is given, this applies to the material under normal conditions of use and may not be appropriate for used material where the properties may have changed. It is the responsibility of the user to check that any waste code recommendation is appropriate to their material in accordance with the recommendation of the European Waste Catalogue.

13.1 Waste treatment methods

SECTION 13: Disposal considerations

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Yes.

Container information: : Since the emptied container retains product residue, follow label warnings even after it has been emptied.

Waste catalogue

Waste code	Waste designation
16 08 02*	spent catalysts containing hazardous transition metals or hazardous transition metal compounds

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

SECTION 14: Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class (es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user : Not applicable.

SECTION 14: Transport information

14.7 Maritime transport in bulk according to IMO instruments : Not available.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

UK (GB)/REACH

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Ozone depleting substances

Not listed.

Prior Informed Consent (PIC)

Not listed.

Persistent Organic Pollutants

Not listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

No listed substance

Seveso Directive

This product is not controlled under the Seveso Directive.

National regulations

Product/ingredient name	List name	Name on list	Classification	Notes
Quartz (SiO2)	UK Occupational Exposure Limits EH40 - WEL	silica, respirable crystalline respirable fraction	Carc.	-

EU regulations

Industrial emissions (integrated pollution prevention and control) - Air : Not listed

Industrial emissions (integrated pollution prevention and control) - Water : Not listed

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

SECTION 15: Regulatory information

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	All components are listed or exempted.
Canada	:	All components are listed or exempted.
China	:	All components are listed or exempted.
Japan	:	**Japan inventory (CSCL)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	All components are listed or exempted.
Turkey	:	All components are listed or exempted.
United States	:	All components are active or exempted.
Viet Nam	:	All components are listed or exempted.

15.2 Chemical safety assessment : This product contains substances for which Chemical Safety Assessments are still required.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms : ATE = Acute Toxicity Estimate
GB CLP = UK CLP (EC No 1272/2008) on the Classification, Labelling and Packaging of Substances and Mixtures as amended by (EU Exit) Regulations 2019 No. 720 and amendments
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = GB CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification

Classification	Justification
Aquatic Chronic 3, H412	Calculation method

Full text of abbreviated H statements

SECTION 16: Other information

H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

Full text of classifications

Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
Aquatic Chronic 3	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3
STOT RE 1	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 1

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