



SAFETY DATA SHEET

1. Identification

Product identifier	Spent Catalyst
Other means of identification	
SDS number	901A - GHS
Synonyms	Spent metal catalyst. See section 16 for complete information.
Recommended use	This product is intended for use as a refinery feedstock, fuel or for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.
Recommended restrictions	None known.
Manufacturer / Importer / Supplier / Distributor information	
Manufacturer/Supplier	Valero Marketing & Supply Company and Affiliates One Valero Way San Antonio, TX 78269-6000 210-345-4593 CorpHSE@valero.com
General Assistance	210-345-4593
E-Mail	CorpHSE@valero.com
Contact Person	Industrial Hygienist
Emergency Telephone	24 Hour Emergency 866-565-5220 1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Self-heating substances and mixtures	Category 1
Health hazards	Acute toxicity, oral	Category 3
	Acute toxicity, inhalation	Category 3
	Skin corrosion/irritation	Category 1A
	Serious eye damage/eye irritation	Category 1
	Sensitization, respiratory	Category 1
	Sensitization, skin	Category 1
	Germ cell mutagenicity	Category 2
	Carcinogenicity	Category 1A
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
	Specific target organ toxicity, repeated exposure	Category 1 (lung, respiratory system)
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 1
OSHA defined hazards	Combustible dust	
Label elements		



Signal word

Danger

Hazard statement

Toxic if swallowed. Causes severe skin burns and eye damage. May cause an allergic skin reaction. Toxic if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. Suspected of causing genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. Causes damage to organs (lung, respiratory system) through prolonged or repeated exposure. Very toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention

Keep cool. Protect from sunlight. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe vapor. In case of inadequate ventilation wear respiratory protection. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection. Contaminated work clothing should not be allowed out of the workplace. Use only outdoors or in a well-ventilated area. Avoid release to the environment.

Response

If exposed or concerned: Get medical advice/attention. If swallowed: Immediately call a poison center/doctor. If inhaled: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms: Call a poison center/doctor. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation or rash occurs: Get medical advice/attention. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Wash contaminated clothing before reuse. Collect spillage.

Storage

Maintain air gap between stacks/pallets. Store locked up. Store in a well-ventilated place. Keep container tightly closed.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)

None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Silicon dioxide	7631-86-9	20 - 60
Nickel	7440-02-0	2 - 30
Nickel oxide	1313-99-1	2 - 30
Nickel sulfide	12035-72-2	2 - 30
Vanadium	7440-62-2	2 - 30
Vanadium pentoxide	1314-62-1	2 - 30
Vanadium sulfide	11130-24-8	2 - 30
Tungsten trioxide	1314-35-8	2 - 24
Molybdenum	7439-98-7	1 - 20
Molybdenum disulphide	1317-33-5	1 - 20
Molybdenum trioxide	1313-27-5	1 - 20
Aluminum oxide	1344-28-1	2 - 10
Coke	64741-79-3	1 - 10
Phosphorus	7723-14-0	0.1 - 10
Phosphorus pentoxide	1314-56-3	0.1 - 10
Phosphorus sulfide	1314-80-3	0.1 - 10
Cobalt	7440-48-4	0.1 - 7
Cobalt oxide	1307-96-6	0.1 - 7
Cobalt sulfide	1317-42-6	0.1 - 7
Calcium oxide	1305-78-8	2 - 6
Iron oxide	1309-37-1	2 - 4
Iron sulfide	1317-37-9	2 - 4
Magnesium oxide	1309-48-4	1 - 3
Arsenic	7440-38-2	0.1 - 3
Arsenic pentoxide	1303-28-2	0.1 - 3
Arsenic trisulfide	1303-33-9	0.1 - 3

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Chromium	7440-47-3	0.1 - 3
Hydrogen sulfide	7783-06-4	0.5 - 2
Sulfur	7704-34-9	0.5 - 2
Titanium dioxide	13463-67-7	0.5 - 2
Antimony	7440-36-0	0.1 - 2
Antimony sulfide	1345-04-6	0.1 - 2
Antimony trioxide	1309-64-4	0.1 - 2
Potassium	7440-09-7	0.1 - 2
Potassium Oxide	12136-45-7	0.1 - 2
Potassium sulfide	1312-73-8	0.1 - 2
Sodium oxide	12401-86-4	0.1 - 2

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a physician or poison control center immediately.
Skin contact	Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Call a physician or poison control center immediately. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Call a physician or poison control center.
Most important symptoms/effects, acute and delayed	Causes chemical burns. Corneal damage. Respiratory tract irritation. Sensitization. Rash. Symptoms may be delayed.
Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	High concentrations of dust may form explosive mixture with air.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
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Methods and materials for containment and cleaning up

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas.

Sweep or scoop up and remove. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Nonsparking tools should be used. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste.

Large Spills: Prevent product from entering drains. Do not allow material to contaminate ground water system.

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Review Firefighting Measures section before proceeding with clean up. Stop leak if it can be done without risk. Use water spray to disperse vapors. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 800-424-8802. For highway or railway spills, contact Chemtrec at 800-424-9300.

7. Handling and storage

Precautions for safe handling

Wear personal protective equipment. Do not breathe dust. Do not get in eyes, on skin, on clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling. Do not handle or store near an open flame, heat or other sources of ignition. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA

Components	Type	Value	Form
Molybdenum trioxide (CAS 1313-27-5)	TWA	15 mg/m3	Total dust.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Arsenic (CAS 7440-38-2)	TWA	0.01 mg/m3

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Aluminum oxide (CAS 1344-28-1)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
Antimony trioxide (CAS 1309-64-4)	PEL	0.5 mg/m3	
Calcium oxide (CAS 1305-78-8)	PEL	5 mg/m3	
Cobalt (CAS 7440-48-4)	PEL	0.1 mg/m3	Dust and fume.
Molybdenum (CAS 7439-98-7)	PEL	15 mg/m3	Total dust.
Molybdenum disulphide (CAS 1317-33-5)	PEL	15 mg/m3	Total dust.
Nickel (CAS 7440-02-0)	PEL	1 mg/m3	
Phosphorus (CAS 7723-14-0)	PEL	0.1 mg/m3	
Phosphorus sulfide (CAS 1314-80-3)	PEL	1 mg/m3	
Titanium dioxide (CAS 13463-67-7)	PEL	15 mg/m3	Total dust.

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US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Vanadium pentoxide (CAS 1314-62-1)	Ceiling	0.5 mg/m3	Respirable dust.
		0.1 mg/m3	Fume.

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Hydrogen sulfide (CAS 7783-06-4)	Ceiling	20 ppm

US. OSHA Table Z-3 (29 CFR 1910.1000)

Components	Type	Value
Silicon dioxide (CAS 7631-86-9)	TWA	0.8 mg/m3
		20 mppcf

ACGIH

Material	Type	Value	Form
Spent Catalyst (CAS Mixture)	TWA	0.5 mg/m3	(total dust)

Components	Type	Value	Form
Molybdenum trioxide (CAS 1313-27-5)	TWA	3 mg/m3	Respirable fraction.
		10 mg/m3	Inhalable fraction.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Aluminum oxide (CAS 1344-28-1)	TWA	1 mg/m3	Respirable fraction.
Antimony trioxide (CAS 1309-64-4)	TWA	0.5 mg/m3	
Arsenic (CAS 7440-38-2)	TWA	0.01 mg/m3	
Arsenic pentoxide (CAS 1303-28-2)	TWA	0.01 mg/m3	
Arsenic trisulfide (CAS 1303-33-9)	TWA	0.01 mg/m3	
Calcium oxide (CAS 1305-78-8)	TWA	2 mg/m3	
Cobalt (CAS 7440-48-4)	TWA	0.02 mg/m3	
Cobalt oxide (CAS 1307-96-6)	TWA	0.02 mg/m3	
Cobalt sulfide (CAS 1317-42-6)	TWA	0.02 mg/m3	
Hydrogen sulfide (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
Molybdenum (CAS 7439-98-7)	TWA	3 mg/m3	Respirable fraction.
		10 mg/m3	Inhalable fraction.
		3 mg/m3	Respirable fraction.
Molybdenum disulphide (CAS 1317-33-5)	TWA	10 mg/m3	Inhalable fraction.
		1.5 mg/m3	Inhalable fraction.
Nickel (CAS 7440-02-0)	TWA	0.2 mg/m3	Inhalable fraction.
Nickel oxide (CAS 1313-99-1)	TWA	0.2 mg/m3	Inhalable fraction.
Nickel sulfide (CAS 12035-72-2)	TWA	0.1 mg/m3	Inhalable fraction.
Phosphorus (CAS 7723-14-0)	TWA	0.1 mg/m3	
Phosphorus sulfide (CAS 1314-80-3)	STEL	3 mg/m3	
	TWA	1 mg/m3	
Titanium dioxide (CAS 13463-67-7)	TWA	10 mg/m3	

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US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Tungsten trioxide (CAS 1314-35-8)	STEL	10 mg/m ³	
	TWA	5 mg/m ³	
Vanadium pentoxide (CAS 1314-62-1)	TWA	0.05 mg/m ³	Inhalable fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value	Form
Antimony trioxide (CAS 1309-64-4)	TWA	0.5 mg/m ³	
Arsenic (CAS 7440-38-2)	Ceiling	0.002 mg/m ³	
Arsenic pentoxide (CAS 1303-28-2)	Ceiling	0.002 mg/m ³	
Arsenic trisulfide (CAS 1303-33-9)	Ceiling	0.002 mg/m ³	
Calcium oxide (CAS 1305-78-8)	TWA	2 mg/m ³	
Cobalt (CAS 7440-48-4)	TWA	0.05 mg/m ³	Dust and fume.
Hydrogen sulfide (CAS 7783-06-4)	Ceiling	15 mg/m ³	
		10 ppm	
Nickel (CAS 7440-02-0)	TWA	0.015 mg/m ³	
Nickel oxide (CAS 1313-99-1)	TWA	0.015 mg/m ³	
Nickel sulfide (CAS 12035-72-2)	TWA	0.015 mg/m ³	
Phosphorus (CAS 7723-14-0)	TWA	0.1 mg/m ³	
Phosphorus sulfide (CAS 1314-80-3)	STEL	3 mg/m ³	
	TWA	1 mg/m ³	
Silicon dioxide (CAS 7631-86-9)	TWA	6 mg/m ³	
Vanadium (CAS 7440-62-2)	STEL	3 mg/m ³	
	TWA	1 mg/m ³	
Vanadium pentoxide (CAS 1314-62-1)	Ceiling	0.05 mg/m ³	Fume.
		0.05 mg/m ³	Dust.
Vanadium sulfide (CAS 11130-24-8)	Ceiling	0.05 mg/m ³	Dust.

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Arsenic (CAS 7440-38-2)	35 µg/l	Inorganic arsenic, plus methylated metabolites, as As	Urine	*
Arsenic pentoxide (CAS 1303-28-2)	35 µg/l	Inorganic arsenic, plus methylated metabolites, as As	Urine	*
Arsenic trisulfide (CAS 1303-33-9)	35 µg/l	Inorganic arsenic, plus methylated metabolites, as As	Urine	*
Cobalt (CAS 7440-48-4)	15 µg/l	Cobalt	Urine	*
	1 µg/l	Cobalt	Blood	*
Cobalt oxide (CAS 1307-96-6)	15 µg/l	Cobalt	Urine	*
	1 µg/l	Cobalt	Blood	*
Cobalt sulfide (CAS 1317-42-6)	15 µg/l	Cobalt	Urine	*

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
	1 µg/l	Cobalt	Blood	*
* - For sampling details, please see the source document.				
Exposure guidelines	No exposure standards allocated.			
Appropriate engineering controls	Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.			
Individual protection measures, such as personal protective equipment				
Eye/face protection	Safety glasses.			
Skin protection				
Hand protection	Wear protective gloves.			
Other	Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.			
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.			
Thermal hazards	Not applicable.			
General hygiene considerations	Consult supervisor for special handling instructions. Do not breathe dust. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.			
9. Physical and chemical properties				
Appearance	Black solid.			
Physical state	Solid.			
Form	Powder or granules.			
Color	Black.			
Odor	Faint.			
Odor threshold	Not available.			
pH	Not available.			
Melting point/freezing point	246.2 °F (119 °C)			
Initial boiling point and boiling range	Not available.			
Flash point	Not available.			
Evaporation rate	Not applicable.			
Flammability (solid, gas)	Combustible dust.			
Upper/lower flammability or explosive limits				
Flammability limit - lower (%)	Not available.			
Flammability limit - upper (%)	Not available.			
Explosive limit - lower (%)	Not available.			
Explosive limit - upper (%)	Not available.			
Vapor pressure	Not applicable.			
Vapor density	Not applicable.			
Relative density	2.1			

Solubility(ies)	
Solubility (water)	Insoluble.
Partition coefficient (n-octanol/water)	No data available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not applicable.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Minimize dust generation and accumulation.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Toxic if swallowed. May cause burns to mouth, throat and stomach.
Inhalation	Toxic if inhaled. Causes respiratory tract irritation. May cause allergic respiratory reaction.
Skin contact	Causes skin burns. May cause an allergic skin reaction.
Eye contact	Causes serious eye damage.

Symptoms related to the physical, chemical and toxicological characteristics May cause chemical burns. Corneal damage. Causes respiratory tract irritation. Sensitization. Rash. Symptoms may be delayed.

Information on toxicological effects

Acute toxicity Toxic if inhaled. Toxic if swallowed.

Components	Species	Test Results
Antimony trioxide (CAS 1309-64-4)		
Acute		
<i>Oral</i>		
LD50	Rat	> 20 g/kg
Arsenic (CAS 7440-38-2)		
Acute		
<i>Oral</i>		
LD50	Rat	763 mg/kg
Arsenic pentoxide (CAS 1303-28-2)		
Acute		
<i>Oral</i>		
LD50	Mouse	55 mg/kg
	Rat	8 mg/kg
Calcium oxide (CAS 1305-78-8)		
Acute		
<i>Oral</i>		
LD50		500 - 2000 mg/kg
Cobalt oxide (CAS 1307-96-6)		
Acute		
<i>Oral</i>		
LD50	Rat	202 mg/kg
<i>Other</i>		
LD50	Mouse	125 mg/kg

Components	Species	Test Results
Hydrogen sulfide (CAS 7783-06-4)		
Acute		
<i>Inhalation</i>		
LC50	Mouse	1.5 mg/l, 18 Minutes
		0.38 mg/l, 410 Minutes
		0.096 mg/l, 804 Minutes
		> 0.024 mg/l, 960 Minutes
	Rat	1.5 mg/l, 14 Minutes
		> 0.38 mg/l, 960 Minutes
Molybdenum disulphide (CAS 1317-33-5)		
Acute		
<i>Inhalation</i>		
LC50	Rat	> 2820 mg/m3, 4 hours
Molybdenum trioxide (CAS 1313-27-5)		
Acute		
<i>Dermal</i>		
LD50	Rat	> 20000 mg/kg
<i>Inhalation</i>		
LC50	Rat	> 5.84 mg/l, 4 hours
<i>Oral</i>		
LD50	Rat	> 2000 mg/kg
Phosphorus pentoxide (CAS 1314-56-3)		
Acute		
<i>Inhalation</i>		
LC50	Mouse	0.271 mg/l, 1 Hours
	Rat	1.217 mg/l, 1 Hours
Skin corrosion/irritation	Causes severe skin burns.	
Serious eye damage/eye irritation	Causes serious eye damage.	
Respiratory or skin sensitization		
Respiratory sensitization	May cause allergy or asthma symptoms or breathing difficulties if inhaled.	
Skin sensitization	May cause an allergic skin reaction.	
Germ cell mutagenicity	Suspected of causing genetic defects.	
Carcinogenicity	May cause cancer.	
IARC Monographs. Overall Evaluation of Carcinogenicity		
Antimony trioxide (CAS 1309-64-4)	2B Possibly carcinogenic to humans.	
Arsenic (CAS 7440-38-2)	1 Carcinogenic to humans.	
Arsenic pentoxide (CAS 1303-28-2)	1 Carcinogenic to humans.	
Cobalt (CAS 7440-48-4)	2B Possibly carcinogenic to humans.	
Cobalt oxide (CAS 1307-96-6)	2B Possibly carcinogenic to humans.	
Cobalt sulfide (CAS 1317-42-6)	2B Possibly carcinogenic to humans.	
Nickel (CAS 7440-02-0)	2B Possibly carcinogenic to humans.	
Nickel oxide (CAS 1313-99-1)	1 Carcinogenic to humans.	
Nickel sulfide (CAS 12035-72-2)	1 Carcinogenic to humans.	
Silicon dioxide (CAS 7631-86-9)	3 Not classifiable as to carcinogenicity to humans.	
Titanium dioxide (CAS 13463-67-7)	2B Possibly carcinogenic to humans.	
Vanadium pentoxide (CAS 1314-62-1)	2B Possibly carcinogenic to humans.	
NTP Report on Carcinogens		
Arsenic (CAS 7440-38-2)	Known To Be Human Carcinogen.	
Arsenic pentoxide (CAS 1303-28-2)	Known To Be Human Carcinogen.	
Arsenic trisulfide (CAS 1303-33-9)	Known To Be Human Carcinogen.	
Nickel (CAS 7440-02-0)	Known To Be Human Carcinogen.	
	Reasonably Anticipated to be a Human Carcinogen.	
Nickel oxide (CAS 1313-99-1)	Known To Be Human Carcinogen.	
Nickel sulfide (CAS 12035-72-2)	Known To Be Human Carcinogen.	
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)		
Arsenic (CAS 7440-38-2)	Cancer	
Arsenic pentoxide (CAS 1303-28-2)	Cancer	

Reproductive toxicity	Suspected of damaging fertility or the unborn child.
Specific target organ toxicity - single exposure	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure	Causes damage to the following organs through prolonged or repeated exposure: Respiratory system. Lungs.
Aspiration hazard	Based on available data, the classification criteria are not met.
Further information	Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere.

12. Ecological information

Ecotoxicity Very toxic to aquatic life with long lasting effects.

Components	Species	Test Results
Antimony trioxide (CAS 1309-64-4)		
Aquatic		
Crustacea	EC50	Water flea (<i>Daphnia magna</i>) 361.5 - 496 mg/l, 48 hours
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>) > 80 mg/l, 96 hours
Arsenic (CAS 7440-38-2)		
Aquatic		
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>) 9.9 mg/l, 96 hours
Arsenic pentoxide (CAS 1303-28-2)		
Aquatic		
Fish	LC50	Striped bass (<i>Morone saxatilis</i>) 6.4 - 13.5 mg/l, 96 hours
Arsenic trisulfide (CAS 1303-33-9)		
Aquatic		
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>) 65.3 - 105.7 mg/l, 96 hours
Calcium oxide (CAS 1305-78-8)		
Aquatic		
Fish	LC50	Carp (<i>Cyprinus carpio</i>) 1070 mg/l, 96 Hours
Hydrogen sulfide (CAS 7783-06-4)		
Aquatic		
Fish	LC50	Bluegill (<i>Lepomis macrochirus</i>) 0.009 mg/l, 96 hours
Molybdenum (CAS 7439-98-7)		
Aquatic		
Fish	LC50	Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>) 800 mg/l, 96 hours
Nickel (CAS 7440-02-0)		
Aquatic		
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>) 2.916 mg/l, 96 hours
Phosphorus (CAS 7723-14-0)		
Aquatic		
Crustacea	EC50	Water flea (<i>Daphnia magna</i>) 0.025 - 0.037 mg/l, 48 hours
Fish	LC50	Bluegill (<i>Lepomis macrochirus</i>) 0.002 - 0.006 mg/l, 96 hours
Vanadium pentoxide (CAS 1314-62-1)		
Aquatic		
Fish	LC50	Tigerfish, crescent perch (<i>Therapon jarbua</i>) 0.62 mg/l, 96 hours
Persistence and degradability	No data available.	
Bioaccumulative potential	No data available.	
Mobility in soil	Not available.	
Other adverse effects	Not available.	

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code K172: WASTE HYDROREFINING CATALYST
D004: Waste Arsenic

US RCRA Hazardous Waste P List: Reference

Arsenic pentoxide (CAS 1303-28-2)	P011
Vanadium pentoxide (CAS 1314-62-1)	P120

US RCRA Hazardous Waste U List: Reference

Hydrogen sulfide (CAS 7783-06-4)	U135
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Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number	UN3190
UN proper shipping name	Self-heating solid, inorganic, n.o.s.; marine pollutant (nickel sulfide)
Transport hazard class(es)	
Class	4.2
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	IB8, IP3, T1, TP33
Packaging exceptions	None
Packaging non bulk	213
Packaging bulk	241

IATA

UN number	UN3190
UN proper shipping name	Self-heating solid, inorganic, n.o.s.; marine pollutant (Nickel sulfide)
Transport hazard class(es)	
Class	4.2
Subsidiary risk	-
Label(s)	4.2
Packing group	III
Environmental hazards	Yes
ERG Code	4L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN3190
UN proper shipping name	SELF-HEATING SOLID, INORGANIC, N.O.S.; MARINE POLLUTANT (NICKEL SULFIDE)
Transport hazard class(es)	
Class	4.2
Subsidiary risk	-
Label(s)	4.2
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-A, S-J
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable. This product is a solid. Therefore, bulk transport is governed by IMSBC code.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200 (OSHA) and 8 CCR § 5194 (Cal/OSHA). All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Arsenic (CAS 7440-38-2)	Cancer
Arsenic pentoxide (CAS 1303-28-2)	Cancer
Arsenic trisulfide (CAS 1303-33-9)	Cancer
Arsenic (CAS 7440-38-2)	Liver
Arsenic pentoxide (CAS 1303-28-2)	Liver
Arsenic trisulfide (CAS 1303-33-9)	Liver
Arsenic (CAS 7440-38-2)	Skin
Arsenic pentoxide (CAS 1303-28-2)	Skin
Arsenic trisulfide (CAS 1303-33-9)	Skin
Arsenic (CAS 7440-38-2)	Respiratory irritation
Arsenic pentoxide (CAS 1303-28-2)	Respiratory irritation
Arsenic trisulfide (CAS 1303-33-9)	Respiratory irritation
Arsenic (CAS 7440-38-2)	Nervous system
Arsenic pentoxide (CAS 1303-28-2)	Nervous system
Arsenic trisulfide (CAS 1303-33-9)	Nervous system
Arsenic (CAS 7440-38-2)	Acute toxicity
Arsenic pentoxide (CAS 1303-28-2)	Acute toxicity
Arsenic trisulfide (CAS 1303-33-9)	Acute toxicity

CERCLA Hazardous Substance List (40 CFR 302.4)

Antimony trioxide (CAS 1309-64-4)	LISTED
Arsenic (CAS 7440-38-2)	LISTED
Arsenic pentoxide (CAS 1303-28-2)	LISTED
Arsenic trisulfide (CAS 1303-33-9)	LISTED
Cobalt (CAS 7440-48-4)	LISTED
Cobalt oxide (CAS 1307-96-6)	LISTED
Cobalt sulfide (CAS 1317-42-6)	LISTED
Hydrogen sulfide (CAS 7783-06-4)	LISTED
Nickel (CAS 7440-02-0)	LISTED
Nickel oxide (CAS 1313-99-1)	LISTED
Nickel sulfide (CAS 12035-72-2)	LISTED
Phosphorus (CAS 7723-14-0)	LISTED
Phosphorus sulfide (CAS 1314-80-3)	LISTED
Vanadium pentoxide (CAS 1314-62-1)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes
	Delayed Hazard - Yes
	Fire Hazard - Yes
	Pressure Hazard - No
	Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity	Threshold planning quantity	Threshold planning quantity, lower value	Threshold planning quantity, upper value
Vanadium pentoxide	1314-62-1	1000		100 lbs	10000 lbs
Phosphorus	7723-14-0	1	100 lbs		
Arsenic pentoxide	1303-28-2	1		100 lbs	10000 lbs
Hydrogen sulfide	7783-06-4	100	500 lbs		

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Nickel	7440-02-0	2 - 30
Nickel oxide	1313-99-1	2 - 30
Nickel sulfide	12035-72-2	2 - 30
Vanadium	7440-62-2	2 - 30
Vanadium pentoxide	1314-62-1	2 - 30
Vanadium sulfide	11130-24-8	2 - 30
Molybdenum trioxide	1313-27-5	1 - 20
Aluminum oxide	1344-28-1	2 - 10
Phosphorus	7723-14-0	0.1 - 10
Cobalt	7440-48-4	0.1 - 7
Arsenic	7440-38-2	0.1 - 3
Arsenic pentoxide	1303-28-2	0.1 - 3
Arsenic trisulfide	1303-33-9	0.1 - 3

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Arsenic trisulfide (CAS 1303-33-9)
Cobalt (CAS 7440-48-4)
Cobalt oxide (CAS 1307-96-6)
Cobalt sulfide (CAS 1317-42-6)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Nickel sulfide (CAS 12035-72-2)
Phosphorus (CAS 7723-14-0)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Hydrogen sulfide (CAS 7783-06-4)

Safe Drinking Water Act Not regulated.
(SDWA)

US state regulations

US. Massachusetts RTK - Substance List

Aluminum oxide (CAS 1344-28-1)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Arsenic trisulfide (CAS 1303-33-9)
Calcium oxide (CAS 1305-78-8)
Cobalt (CAS 7440-48-4)
Hydrogen sulfide (CAS 7783-06-4)
Molybdenum (CAS 7439-98-7)
Molybdenum disulphide (CAS 1317-33-5)
Molybdenum trioxide (CAS 1313-27-5)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Nickel sulfide (CAS 12035-72-2)
Phosphorus (CAS 7723-14-0)
Phosphorus pentoxide (CAS 1314-56-3)
Phosphorus sulfide (CAS 1314-80-3)
Potassium sulfide (CAS 1312-73-8)
Silicon dioxide (CAS 7631-86-9)
Titanium dioxide (CAS 13463-67-7)
Vanadium (CAS 7440-62-2)
Vanadium pentoxide (CAS 1314-62-1)

US. New Jersey Worker and Community Right-to-Know Act

Aluminum oxide (CAS 1344-28-1)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Arsenic trisulfide (CAS 1303-33-9)
Calcium oxide (CAS 1305-78-8)
Cobalt oxide (CAS 1307-96-6)
Cobalt sulfide (CAS 1317-42-6)
Hydrogen sulfide (CAS 7783-06-4)
Molybdenum (CAS 7439-98-7)
Molybdenum trioxide (CAS 1313-27-5)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Nickel sulfide (CAS 12035-72-2)
Phosphorus (CAS 7723-14-0)
Phosphorus pentoxide (CAS 1314-56-3)
Phosphorus sulfide (CAS 1314-80-3)
Potassium sulfide (CAS 1312-73-8)
Silicon dioxide (CAS 7631-86-9)
Titanium dioxide (CAS 13463-67-7)
Vanadium (CAS 7440-62-2)
Vanadium pentoxide (CAS 1314-62-1)
Vanadium sulfide (CAS 11130-24-8)

US. Pennsylvania Worker and Community Right-to-Know Law

Aluminum oxide (CAS 1344-28-1)
Antimony trioxide (CAS 1309-64-4)

Arsenic (CAS 7440-38-2)
 Arsenic pentoxide (CAS 1303-28-2)
 Arsenic trisulfide (CAS 1303-33-9)
 Calcium oxide (CAS 1305-78-8)
 Cobalt (CAS 7440-48-4)
 Hydrogen sulfide (CAS 7783-06-4)
 Molybdenum (CAS 7439-98-7)
 Molybdenum trioxide (CAS 1313-27-5)
 Nickel (CAS 7440-02-0)
 Nickel oxide (CAS 1313-99-1)
 Nickel sulfide (CAS 12035-72-2)
 Phosphorus (CAS 7723-14-0)
 Phosphorus pentoxide (CAS 1314-56-3)
 Phosphorus sulfide (CAS 1314-80-3)
 Potassium sulfide (CAS 1312-73-8)
 Silicon dioxide (CAS 7631-86-9)
 Titanium dioxide (CAS 13463-67-7)
 Vanadium (CAS 7440-62-2)
 Vanadium pentoxide (CAS 1314-62-1)

US. Rhode Island RTK

Aluminum oxide (CAS 1344-28-1)
 Antimony trioxide (CAS 1309-64-4)
 Arsenic (CAS 7440-38-2)
 Arsenic pentoxide (CAS 1303-28-2)
 Arsenic trisulfide (CAS 1303-33-9)
 Cobalt (CAS 7440-48-4)
 Cobalt oxide (CAS 1307-96-6)
 Cobalt sulfide (CAS 1317-42-6)
 Hydrogen sulfide (CAS 7783-06-4)
 Nickel (CAS 7440-02-0)
 Nickel oxide (CAS 1313-99-1)
 Nickel sulfide (CAS 12035-72-2)
 Phosphorus (CAS 7723-14-0)
 Phosphorus sulfide (CAS 1314-80-3)
 Vanadium (CAS 7440-62-2)
 Vanadium pentoxide (CAS 1314-62-1)
 Vanadium sulfide (CAS 11130-24-8)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Antimony trioxide (CAS 1309-64-4)
 Arsenic (CAS 7440-38-2)
 Arsenic trisulfide (CAS 1303-33-9)
 Cobalt (CAS 7440-48-4)
 Cobalt oxide (CAS 1307-96-6)
 Nickel (CAS 7440-02-0)
 Nickel oxide (CAS 1313-99-1)
 Nickel sulfide (CAS 12035-72-2)
 Titanium dioxide (CAS 13463-67-7)
 Vanadium pentoxide (CAS 1314-62-1)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

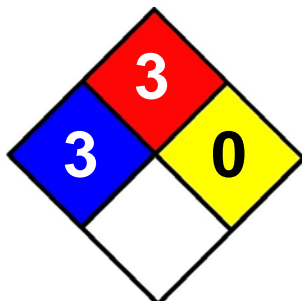
16. Other information, including date of preparation or last revision

Issue date 26-March-2014

Revision date -

Version # 01

NFPA Ratings



References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

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