




SAFETY DATA SHEET

1. Identification

Product identifier	Spent Hydrotreating Catalyst
Other means of identification	
SDS number	902 - GHS
Synonyms	Spent hydrotreating 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
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	Not classified.	
Health hazards	Acute toxicity, oral	Category 4
	Acute toxicity, inhalation	Category 4
	Skin corrosion/irritation	Category 1A
	Serious eye damage/eye irritation	Category 1
	Sensitization, respiratory	Category 1
	Sensitization, skin	Category 1
	Germ cell mutagenicity	Category 1B
	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 (central nervous system, hematopoietic system, lungs)
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 2
	Hazardous to the aquatic environment, long-term hazard	Category 2
OSHA defined hazards	Combustible dust	
Label elements		
Signal word	Danger	

Hazard statement May form combustible dust concentrations in air. Harmful if swallowed. Causes severe skin burns and eye damage. May cause an allergic skin reaction. Harmful if inhaled. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause respiratory irritation. May cause genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. Causes damage to organs (central nervous system, hematopoietic system, lungs) through prolonged or repeated exposure. Toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Prevent dust accumulation to minimize explosion hazard. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Do not breathe dust. Avoid breathing vapors. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Contaminated work clothing must not be allowed out of the workplace. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. In case of inadequate ventilation wear respiratory protection. Observe good industrial hygiene practices.

Response 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 inhaled: Remove person to fresh air and keep comfortable for breathing. 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/doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. In case of fire: Use appropriate media to extinguish. Collect spillage.

Storage Store in a well-ventilated place. Keep container tightly closed. Store locked up.

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

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Silicon dioxide, crystalline silica-free	7631-86-9	20 - 60
Nickel	7440-02-0	2 - 40
Nickel oxide	1313-99-1	2 - 40
Vanadium	7440-62-2	2 - 30
Vanadium pentoxide	1314-62-1	2 - 30
Molybdenum	7439-98-7	1 - 20
Molybdenum trioxide	1313-27-5	1 - 20
Aluminum oxide	1344-28-1	2 - 10
Coke	64741-79-3	1 - 10
Phosphoric pentoxide	1314-56-3	0.1 - 10
Cobalt	7440-48-4	0.1 - 7
Cobalt oxide	1307-96-6	0.1 - 7
Calcium oxide	1305-78-8	2 - 6
Iron oxide	1309-37-1	2 - 4
Magnesium oxide	1309-48-4	1 - 3
Arsenic	7440-38-2	0.1 - 3
Arsenic pentoxide	1303-28-2	0.1 - 3
Chromium	7440-47-3	0.1 - 3
Titanium dioxide	13463-67-7	0.5 - 2
Antimony	7440-36-0	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
Sodium oxide	12401-86-4	0.1 - 2
Hydrogen sulfide	7783-06-4	0 - 2

Chemical name	CAS number	%
Benzene	71-43-2	0.1 - 1

Composition comments Material composition varies significantly depending on catalyst batch and refining process chemistry. Composition ranges are provided for hazard communication purposes only, and should not be used to determine regulatory compliance with any specific regulation, or to determine suitability to any specific use. Any specific use of this product or compliance with safety, transportation, and environmental regulations requires sampling and analysis by a qualified laboratory to determine the precise composition of any particular batch.

4. First-aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If experiencing respiratory symptoms: Call a poison center or doctor/physician.

Skin contact Remove contaminated clothing immediately and wash skin with soap and water. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Do not rub eyes. 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 Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Most important symptoms/effects, acute and delayed Narcosis. Behavioral changes. Decrease in motor functions. Unconsciousness. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Coughing. Difficulty in breathing. Cyanosis (blue tissue condition, nails, lips, and/or skin). Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). 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 reuse.

5. Fire-fighting measures

Suitable extinguishing media Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture. Water fog. Foam. Dry chemical powder. Dry sand. Carbon dioxide (CO₂). Apply extinguishing media carefully to avoid creating airborne dust.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical Explosion hazard: Avoid generating dust; fine dust dispersed in air in sufficient concentrations and in the presence of an ignition source is a potential dust explosion hazard. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards May form combustible dust concentrations in air.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Use only non-sparking tools. 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. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Minimize dust generation and accumulation. Collect dust using a vacuum cleaner equipped with HEPA filter. The product is immiscible with water and will sediment in water systems. Prevent product from entering drains. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. Put material in suitable, covered, labeled containers. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions. 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. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Explosion-proof general and local exhaust ventilation.

Do not breathe dust. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Pregnant or breastfeeding women must not handle this product. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from food, drink and animal feedingstuffs. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA Components

Components	Type	Value	Form
Molybdenum trioxide (CAS 1313-27-5)	TWA	15 mg/m ³	Total dust.
Silicon dioxide, crystalline silica-free (CAS 7631-86-9)	TWA	80 mg/m ³	

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Components	Type	Value
Arsenic (CAS 7440-38-2)	TWA	0.01 mg/m ³
Benzene (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

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/m ³	Respirable fraction.
		15 mg/m ³	Total dust.
Antimony (CAS 7440-36-0)	PEL	0.5 mg/m ³	
Antimony trioxide (CAS 1309-64-4)	PEL	0.5 mg/m ³	
Calcium oxide (CAS 1305-78-8)	PEL	5 mg/m ³	
Chromium (CAS 7440-47-3)	PEL	1 mg/m ³	

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

Components	Type	Value	Form
Cobalt (CAS 7440-48-4)	PEL	0.1 mg/m3	Dust and fume.
Iron oxide (CAS 1309-37-1)	PEL	10 mg/m3	Fume.
Magnesium oxide (CAS 1309-48-4)	PEL	15 mg/m3	Total particulate.
Molybdenum (CAS 7439-98-7)	PEL	15 mg/m3	Total dust.
Molybdenum trioxide (CAS 1313-27-5)	PEL	5 mg/m3	
Nickel (CAS 7440-02-0)	PEL	1 mg/m3	
Nickel oxide (CAS 1313-99-1)	PEL	1 mg/m3	
Titanium dioxide (CAS 13463-67-7)	PEL	15 mg/m3	Total dust.
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
Benzene (CAS 71-43-2)	Ceiling	25 ppm
	TWA	10 ppm
Hydrogen sulfide (CAS 7783-06-4)	Ceiling	20 ppm

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

Components	Type	Value	Form
Aluminum oxide (CAS 1344-28-1)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
Coke (CAS 64741-79-3)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
Iron oxide (CAS 1309-37-1)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
Magnesium oxide (CAS 1309-48-4)	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
Silicon dioxide, crystalline silica-free (CAS 7631-86-9)	TWA	20 mppcf	

ACGIH

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

ACGIH 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 (CAS 7440-36-0)	TWA	0.5 mg/m3	
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	
Benzene (CAS 71-43-2)	STEL	2.5 ppm	
	TWA	0.5 ppm	
Calcium oxide (CAS 1305-78-8)	TWA	2 mg/m3	
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3	Inhalable fraction.
Cobalt (CAS 7440-48-4)	TWA	0.02 mg/m3	
Cobalt oxide (CAS 1307-96-6)	TWA	0.02 mg/m3	
Hydrogen sulfide (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
Iron oxide (CAS 1309-37-1)	TWA	5 mg/m3	Respirable fraction.
Magnesium oxide (CAS 1309-48-4)	TWA	10 mg/m3	Inhalable fraction.
Molybdenum (CAS 7439-98-7)	TWA	3 mg/m3	Respirable fraction.
		10 mg/m3	Inhalable fraction.
Molybdenum trioxide (CAS 1313-27-5)	TWA	0.5 mg/m3	Respirable fraction.
Nickel (CAS 7440-02-0)	TWA	1.5 mg/m3	Inhalable fraction.
Nickel oxide (CAS 1313-99-1)	TWA	0.2 mg/m3	Inhalable fraction.
Titanium dioxide (CAS 13463-67-7)	TWA	10 mg/m3	
Vanadium pentoxide (CAS 1314-62-1)	TWA	0.05 mg/m3	Inhalable fraction.
US. NIOSH: Pocket Guide to Chemical Hazards			
Components	Type	Value	Form
Antimony (CAS 7440-36-0)	TWA	0.5 mg/m3	
Antimony trioxide (CAS 1309-64-4)	TWA	0.5 mg/m3	
Arsenic (CAS 7440-38-2)	Ceiling	0.002 mg/m3	
Arsenic pentoxide (CAS 1303-28-2)	Ceiling	0.002 mg/m3	
Benzene (CAS 71-43-2)	STEL	1 ppm	
	TWA	0.1 ppm	
Calcium oxide (CAS 1305-78-8)	TWA	2 mg/m3	
Chromium (CAS 7440-47-3)	TWA	0.5 mg/m3	

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value	Form
Cobalt (CAS 7440-48-4)	TWA	0.05 mg/m3	Dust and fume.
Hydrogen sulfide (CAS 7783-06-4)	Ceiling	15 mg/m3	
		10 ppm	
Iron oxide (CAS 1309-37-1)	TWA	5 mg/m3	Dust and fume.
Nickel (CAS 7440-02-0)	TWA	0.015 mg/m3	
Nickel oxide (CAS 1313-99-1)	TWA	0.015 mg/m3	
Silicon dioxide, crystalline silica-free (CAS 7631-86-9)	TWA	6 mg/m3	
Vanadium (CAS 7440-62-2)	STEL	3 mg/m3	
	TWA	1 mg/m3	
Vanadium pentoxide (CAS 1314-62-1)	Ceiling	0.05 mg/m3	Fume.
		0.05 mg/m3	Dust.

Biological limit values**ACGIH**

Components	Value	Determinant	Specimen	Sampling Time
Benzene (CAS 71-43-2)	500 µg/g	t,t-Muconic acid	Creatinine in urine	*

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	*
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercapturic acid	Creatinine in urine	*
Cobalt (CAS 7440-48-4)	15 µg/l	Cobalt	Urine	*
Cobalt oxide (CAS 1307-96-6)	15 µg/l	Cobalt	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines No exposure standards allocated.

US - California OELs: Skin designation

Benzene (CAS 71-43-2) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Benzene (CAS 71-43-2) Danger of cutaneous absorption

US. NIOSH: Pocket Guide to Chemical Hazards

Arsenic (CAS 7440-38-2) Can be absorbed through the skin.

Arsenic pentoxide (CAS 1303-28-2) Can be absorbed through the skin.

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	Wear approved safety goggles.
Skin protection	
Hand protection	Wear chemical-resistant, impervious 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

Physical state	Solid.
Form	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.
Other information	
Explosive properties	Not explosive.
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Catalyst may undergo self-heating when exposed to oxygen.
Possibility of hazardous reactions	May be self-heating in the presence of oxygen.
Conditions to avoid	Keep away from heat, sparks and open flame. Contact with incompatible materials. Minimize dust generation and accumulation.
Incompatible materials	Oxygen. Combustible material. Strong acids. Strong oxidizing agents. Chlorine. Fluorine.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Harmful 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.
Ingestion	Harmful if swallowed. May cause burns to mouth, throat and stomach.

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 Harmful if inhaled or swallowed.

Components	Species	Test Results
Antimony (CAS 7440-36-0)		
<u>Acute</u>		
Oral		
LD50	Rat	100 mg/kg
Antimony trioxide (CAS 1309-64-4)		
<u>Acute</u>		
Oral		
LD50	Rat	> 20 g/kg
Arsenic (CAS 7440-38-2)		
<u>Acute</u>		
Oral		
LD50	Mouse	145 mg/kg
	Rat	763 mg/kg
Benzene (CAS 71-43-2)		
<u>Acute</u>		
Oral		
LD50	Rat	930 mg/kg
Hydrogen sulfide (CAS 7783-06-4)		
<u>Acute</u>		
Inhalation		
Gas		
LC50	Rat	444 ppm, 4 Hours
Magnesium oxide (CAS 1309-48-4)		
<u>Acute</u>		
Oral		
LD50	Rat	3870 - 3990 mg/kg

Components	Species	Test Results
Molybdenum trioxide (CAS 1313-27-5)		
Acute		
Dermal		
LD50	Rat	> 20000 mg/kg
Inhalation		
LC50	Rat	> 5.84 mg/l, 4 hours
Oral		
LD50	Rat	> 2000 mg/kg
Nickel (CAS 7440-02-0)		
Acute		
Inhalation		
NOAEC	Rat	10200 mg/l, 1 hours
Oral		
LD50	Rat	> 9000 mg/kg
Nickel oxide (CAS 1313-99-1)		
Acute		
Inhalation		
LC50	Rat	> 5.08 mg/l, 4 Hours
Oral		
LD50	Rat	8796 mg/kg
Phosphoric pentoxide (CAS 1314-56-3)		
Acute		
Inhalation		
<i>Dust</i>		
LC50	Rat	1217 mg/m ³ , 1 Hours
Potassium oxide (CAS 12136-45-7)		
Acute		
Oral		
LD50	Rat	273 mg/kg
Silicon dioxide, crystalline silica-free (CAS 7631-86-9)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg, 24 Hours
Inhalation		
<i>Dust</i>		
LC50	Rat	> 0.14 mg/l, 4 Hours
Oral		
LD50	Rat	> 3300 mg/kg
Titanium dioxide (CAS 13463-67-7)		
Acute		
Oral		
LD50	Rat	> 5000 mg/kg
Skin corrosion/irritation	Causes severe skin burns.	
Serious eye damage/eye irritation	Causes serious eye damage.	
Respiratory or skin sensitization		
ACGIH sensitization		
Cobalt and inorganic compounds, as Co (CAS 1307-96-6)	Dermal sensitization	Respiratory sensitization

Cobalt and inorganic compounds, as Co
(CAS 7440-48-4)

Dermal sensitization

Respiratory 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 May cause 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.
Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Chromium (CAS 7440-47-3)	3 Not classifiable as to carcinogenicity to humans.
Cobalt (CAS 7440-48-4)	2B Possibly carcinogenic to humans.
Cobalt oxide (CAS 1307-96-6)	2B Possibly carcinogenic to humans.
Coke (CAS 64741-79-3)	1 Carcinogenic to humans.
Iron oxide (CAS 1309-37-1)	3 Not classifiable as to carcinogenicity to humans.
Molybdenum trioxide (CAS 1313-27-5)	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.
Silicon dioxide, crystalline silica-free (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.
Benzene (CAS 71-43-2)	Known To Be Human Carcinogen.
Cobalt (CAS 7440-48-4)	Reasonably Anticipated to be a Human Carcinogen.
Cobalt oxide (CAS 1307-96-6)	Reasonably Anticipated to be a Human Carcinogen.
Nickel (CAS 7440-02-0)	Reasonably Anticipated to be a Human Carcinogen.
Nickel oxide (CAS 1313-99-1)	Known To Be Human Carcinogen.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Arsenic (CAS 7440-38-2)	Cancer
Arsenic pentoxide (CAS 1303-28-2)	Cancer
Benzene (CAS 71-43-2)	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 organs (central nervous system, hematopoietic system, lungs) through prolonged or repeated exposure.

Aspiration hazard Not an aspiration hazard.

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. Contains benzene. Human epidemiology studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-producing system and serious blood disorders, including leukemia. Animal tests suggest that prolonged and/or repeated overexposure to benzene may damage the embryo/fetus. The relevance of these animal studies to humans has not been fully established.

12. Ecological information

Ecotoxicity Toxic to aquatic life with long lasting effects.

Components	Species	Test Results
Antimony trioxide (CAS 1309-64-4)		
Aquatic		
<i>Acute</i>		
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

Components	Species	Test Results
Cobalt (CAS 7440-48-4)		
Aquatic		
<i>Acute</i>		
Fish	LC50	Goldfish (<i>Carassius auratus</i>) 0.81 mg/l, 7 days
Hydrogen sulfide (CAS 7783-06-4)		
Aquatic		
<i>Acute</i>		
Crustacea	EC50	Crustacea 0.042 mg/l, 48 Hours
Fish	LC50	Fathead minnow (<i>Pimephales promelas</i>) 0.0243 mg/l, 96 hours
Nickel (CAS 7440-02-0)		
Aquatic		
<i>Chronic</i>		
Crustacea	NOEC	<i>Ceriodaphnia dubia</i> 2.8 µg/l
Fish	NOEC	Zebra danio (<i>Danio rerio</i>) 40 µg/l
Potassium oxide (CAS 12136-45-7)		
Aquatic		
<i>Acute</i>		
Fish	LC50	Mosquitofish (<i>Gambusia affinis affinis</i>) 80 mg/l, 96 hours
Titanium dioxide (CAS 13463-67-7)		
Aquatic		
<i>Acute</i>		
Crustacea	EC50	<i>Daphnia magna</i> > 100 mg/l, 48 Hours
Fish	LL50	<i>Oryzias latipes</i> > 100 mg/l, 96 Hours

Persistence and degradability No data available.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Benzene (CAS 71-43-2) 2.13

Mobility in soil Not available.

Other adverse effects No data 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 The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

This material may be exempted from Federal RCRA regulations via the Transfer-Based Exclusion found at 40 CFR 261.4(a)(24-25) or applicable State Verified Recycling Exemption/Facility rules. The State of California does not recognize the Transfer-Based Exclusion; please follow California regulations.

Possible D004: Arsenic
When offered for disposal, the RCRA waste code is: Spent Hydrotreating Catalyst (K171) and/or Spent Hydrorefining Catalyst (K172)

Waste from residues / unused products Dispose in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

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.

General information

ATTENTION: MATERIAL CLASSIFICATION AND ASSIGNMENT OF PROPER SHIPPING NAME REQUIRES THE SHIPPER TO OBTAIN ANALYTICAL DATA. The Shipper is solely responsible for obtaining representative analytical data for each shipment, and classifications for Listed Wastes, Marine Pollutants, and other characteristics may be applicable.

Example Shipping descriptions are listed below for illustrative purposes only, and may not be suitable to any particular shipment.

Example #1 UN3077, environmentally hazardous substance, solid, nos, (petroleum distillates), PGIII

Example #2 UN3190, Self-heating solid, inorganic, n.o.s., 4.2, III

Example #3: UN3190, Waste, Self-heating solid, inorganic, n.o.s. (Nickel, Arsenic), 4.2, III, RQ (K171)

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

This material may be exempted from Federal RCRA regulations via the Transfer-Based Exclusion found at 40 CFR 261.4(a)(24-25) or applicable State Verified Recycling Exemption/Facility rules. The State of California does not recognize the Transfer-Based Exclusion; please follow California regulations.

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

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Antimony (CAS 7440-36-0)	Listed.
Antimony trioxide (CAS 1309-64-4)	Listed.
Arsenic (CAS 7440-38-2)	Listed.
Arsenic pentoxide (CAS 1303-28-2)	Listed.
Benzene (CAS 71-43-2)	Listed.
Chromium (CAS 7440-47-3)	Listed.
Cobalt (CAS 7440-48-4)	Listed.
Cobalt oxide (CAS 1307-96-6)	Listed.
Hydrogen sulfide (CAS 7783-06-4)	Listed.
Nickel (CAS 7440-02-0)	Listed.
Nickel oxide (CAS 1313-99-1)	Listed.
Vanadium pentoxide (CAS 1314-62-1)	Listed.

SARA 304 Emergency release notification

Arsenic pentoxide (CAS 1303-28-2)	1 LBS
Hydrogen sulfide (CAS 7783-06-4)	100 LBS
Vanadium pentoxide (CAS 1314-62-1)	1000 LBS

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1053)

Arsenic (CAS 7440-38-2)	Cancer
Arsenic pentoxide (CAS 1303-28-2)	Cancer
Benzene (CAS 71-43-2)	Cancer
Arsenic (CAS 7440-38-2)	Liver
Arsenic pentoxide (CAS 1303-28-2)	Liver
Benzene (CAS 71-43-2)	Central nervous system
Arsenic (CAS 7440-38-2)	Skin
Arsenic pentoxide (CAS 1303-28-2)	Skin
Benzene (CAS 71-43-2)	Blood
Arsenic (CAS 7440-38-2)	Respiratory irritation
Arsenic pentoxide (CAS 1303-28-2)	Respiratory irritation
Benzene (CAS 71-43-2)	Aspiration
Arsenic (CAS 7440-38-2)	Nervous system
Arsenic pentoxide (CAS 1303-28-2)	Nervous system
Benzene (CAS 71-43-2)	Skin
Arsenic (CAS 7440-38-2)	Acute toxicity
Arsenic pentoxide (CAS 1303-28-2)	Acute toxicity
Benzene (CAS 71-43-2)	Eye
	respiratory tract irritation
	Flammability

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Chemical name	CAS number	Reportable quantity (pounds)	Threshold planning quantity (pounds)	Threshold planning quantity, lower value (pounds)	Threshold planning quantity, upper value (pounds)
Vanadium pentoxide	1314-62-1	1000		100	10000
Arsenic pentoxide	1303-28-2	1		100	10000
Hydrogen sulfide	7783-06-4	100	500		

SARA 311/312 Hazardous chemical

Classified hazard categories	Combustible dust Acute toxicity (any route of exposure) Skin corrosion or irritation Serious eye damage or eye irritation Respiratory or skin sensitization Germ cell mutagenicity Carcinogenicity Reproductive toxicity Specific target organ toxicity (single or repeated exposure)
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SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Aluminum oxide	1344-28-1	2 - 10
Antimony	7440-36-0	0.1 - 2
Antimony trioxide	1309-64-4	0.1 - 2
Arsenic	7440-38-2	0.1 - 3
Arsenic pentoxide	1303-28-2	0.1 - 3
Benzene	71-43-2	0.1 - 1
Chromium	7440-47-3	0.1 - 3
Cobalt	7440-48-4	0.1 - 7
Hydrogen sulfide	7783-06-4	0 - 2
Molybdenum trioxide	1313-27-5	1 - 20
Nickel	7440-02-0	2 - 40
Nickel oxide	1313-99-1	2 - 40
Vanadium	7440-62-2	2 - 30
Vanadium pentoxide	1314-62-1	2 - 30

Other federal regulations

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

Antimony (CAS 7440-36-0)
 Antimony trioxide (CAS 1309-64-4)
 Arsenic (CAS 7440-38-2)
 Arsenic pentoxide (CAS 1303-28-2)
 Benzene (CAS 71-43-2)
 Chromium (CAS 7440-47-3)
 Cobalt (CAS 7440-48-4)
 Cobalt oxide (CAS 1307-96-6)
 Nickel (CAS 7440-02-0)
 Nickel oxide (CAS 1313-99-1)

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

Hydrogen sulfide (CAS 7783-06-4)

Safe Drinking Water Act (SDWA) Contains component(s) regulated under the Safe Drinking Water Act.

FEMA Priority Substances Respiratory Health and Safety in the Flavor Manufacturing Workplace

Hydrogen sulfide (CAS 7783-06-4) High priority

US state regulations

US. Massachusetts RTK - Substance List

Aluminum oxide (CAS 1344-28-1)
 Antimony (CAS 7440-36-0)
 Antimony trioxide (CAS 1309-64-4)

Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Benzene (CAS 71-43-2)
Calcium oxide (CAS 1305-78-8)
Chromium (CAS 7440-47-3)
Cobalt (CAS 7440-48-4)
Hydrogen sulfide (CAS 7783-06-4)
Iron oxide (CAS 1309-37-1)
Magnesium oxide (CAS 1309-48-4)
Molybdenum (CAS 7439-98-7)
Molybdenum trioxide (CAS 1313-27-5)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Phosphoric pentoxide (CAS 1314-56-3)
Silicon dioxide, crystalline silica-free (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 (CAS 7440-36-0)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Benzene (CAS 71-43-2)
Calcium oxide (CAS 1305-78-8)
Chromium (CAS 7440-47-3)
Cobalt (CAS 7440-48-4)
Cobalt oxide (CAS 1307-96-6)
Hydrogen sulfide (CAS 7783-06-4)
Iron oxide (CAS 1309-37-1)
Magnesium oxide (CAS 1309-48-4)
Molybdenum (CAS 7439-98-7)
Molybdenum trioxide (CAS 1313-27-5)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Phosphoric pentoxide (CAS 1314-56-3)
Potassium oxide (CAS 12136-45-7)
Titanium dioxide (CAS 13463-67-7)
Vanadium (CAS 7440-62-2)
Vanadium pentoxide (CAS 1314-62-1)

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

Aluminum oxide (CAS 1344-28-1)
Antimony (CAS 7440-36-0)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Benzene (CAS 71-43-2)
Calcium oxide (CAS 1305-78-8)
Chromium (CAS 7440-47-3)
Cobalt (CAS 7440-48-4)
Cobalt oxide (CAS 1307-96-6)
Coke (CAS 64741-79-3)
Hydrogen sulfide (CAS 7783-06-4)
Iron oxide (CAS 1309-37-1)
Magnesium oxide (CAS 1309-48-4)
Molybdenum (CAS 7439-98-7)
Molybdenum trioxide (CAS 1313-27-5)
Nickel (CAS 7440-02-0)
Nickel oxide (CAS 1313-99-1)
Phosphoric pentoxide (CAS 1314-56-3)
Silicon dioxide, crystalline silica-free (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 (CAS 7440-36-0)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Benzene (CAS 71-43-2)
Calcium oxide (CAS 1305-78-8)
Chromium (CAS 7440-47-3)
Cobalt (CAS 7440-48-4)
Coke (CAS 64741-79-3)
Hydrogen sulfide (CAS 7783-06-4)
Iron oxide (CAS 1309-37-1)
Magnesium oxide (CAS 1309-48-4)
Molybdenum (CAS 7439-98-7)
Nickel (CAS 7440-02-0)
Titanium dioxide (CAS 13463-67-7)
Vanadium pentoxide (CAS 1314-62-1)

California Proposition 65



WARNING: This product can expose you to chemicals including Arsenic pentoxide, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

California Proposition 65 - CRT: Listed date/Carcinogenic substance

Antimony trioxide (CAS 1309-64-4)	Listed: October 1, 1990
Arsenic (CAS 7440-38-2)	Listed: February 27, 1987
Arsenic pentoxide (CAS 1303-28-2)	Listed: February 27, 1987
Benzene (CAS 71-43-2)	Listed: February 27, 1987
Cobalt (CAS 7440-48-4)	Listed: July 1, 1992
Cobalt oxide (CAS 1307-96-6)	Listed: July 1, 1992
Nickel (CAS 7440-02-0)	Listed: October 1, 1989
Nickel oxide (CAS 1313-99-1)	Listed: October 1, 1989
Titanium dioxide (CAS 13463-67-7)	Listed: September 2, 2011
Vanadium pentoxide (CAS 1314-62-1)	Listed: February 11, 2005

California Proposition 65 - CRT: Listed date/Developmental toxin

Arsenic pentoxide (CAS 1303-28-2)	Listed: May 1, 1997
Benzene (CAS 71-43-2)	Listed: December 26, 1997

California Proposition 65 - CRT: Listed date/Male reproductive toxin

Benzene (CAS 71-43-2)	Listed: December 26, 1997
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US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

Antimony (CAS 7440-36-0)
Antimony trioxide (CAS 1309-64-4)
Arsenic (CAS 7440-38-2)
Arsenic pentoxide (CAS 1303-28-2)
Benzene (CAS 71-43-2)
Chromium (CAS 7440-47-3)
Cobalt (CAS 7440-48-4)
Cobalt oxide (CAS 1307-96-6)
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)
Titanium dioxide (CAS 13463-67-7)
Vanadium (CAS 7440-62-2)
Vanadium pentoxide (CAS 1314-62-1)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Industrial Chemicals (AICIS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
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	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply 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	27-June-2013
Revision date	24-May-2021
Version #	04
Further information	Refer to: OSHA 3371-08 2009, Hazard Communication Guidance for Combustible Dusts NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
HMIS® ratings	Health: 3* Flammability: 2 Physical hazard: 0
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
Disclaimer	The information in this Safety Data Sheet (SDS) was obtained from sources believed to be reliable and accurate, and is not represented as being absolutely complete. The end user of this product has the responsibility for evaluating the adequacy of the data for the intended application and conditions of use; for determining the safety, toxicity, regulatory requirements, and suitability of the product under these conditions; and for obtaining additional or clarifying data where uncertainty exists. The data serves as general guidance only, and is to be used in combination with professional judgement of persons experienced in a specific application, use or process; and additional data may be required. Valero Marketing & Supply Co., (Valero) provides this data without any warranty, expressed or implied regarding its correctness or accuracy; and does not assume any liability arising out of product handling, storage, use or disposal by others.