



# MATERIAL SAFETY DATA SHEET

## Spent Hydrotreating Catalyst

VALERO MARKETING & SUPPLY COMPANY  
and Affiliates  
P.O. Box 696000  
San Antonio, TX 78269-6000

### Emergency Phone Numbers

24 Hour Emergency: 866-565-5220  
Chemtrec Emergency: 800-424-9300/703-527-3887

### General Assistance

General Assistance: 210-345-4593

**BRAND NAMES:** Valero, Diamond Shamrock, Shamrock, Ultramar, Beacon, Total

## Section 1. Chemical Product and Company Identification

**Common / Trade name** : Spent Hydrotreating Catalyst

**Synonym** :

**SYNONYMS/COMMON NAMES:** This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product and are not reflected in this document. Consult specification sheets for technical information. This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Material uses** : 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.

**MSDS #** : 902

**CAS #** : Mixture

## Section 2. Composition, information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>Concentration (%)</u>
Silicates, amorphous	7631-86-9	20 - 60
Nickel Oxide	1313-99-1	2 - 30
Nickel	7440-02-0	2 - 30
Vanadium	7440-62-2	2 - 30
Vanadium Pentoxide	1314-62-1	2 - 30
Molybdenum Trioxide	1313-27-5	1 - 20
Molybdenum	7439-98-7	1 - 20
Alumina	1344-28-1	2 - 10
Petroleum Coke	64741-79-3	1 - 10
Phosphorus Pentoxide	1314-56-3	0.1 - 10
Calcium Oxide	1305-78-8	2 - 6
Cobalt Oxide	1307-96-6	0.1 - 7
Cobalt	7440-48-4	0.1 - 7
Ferric Oxide	1309-37-1	2 - 4
Magnesium Oxide	1309-48-4	1 - 3
Chromium	7440-47-3	0.1 - 3
Arsenic Pentoxide	1303-28-2	0.1 - 3
Arsenic	7440-38-2	0.1 - 3

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Titanium Oxide	13463-67-7	0.5 - 2
Sodium Oxide	12401-86-4	0.1 - 2
Antimony Trioxide	1309-64-4	0.1 - 2
Antimony	7440-36-0	0.1 - 2
Potassium Oxide	12136-45-7	0.1 - 2
Potassium	7440-09-7	0.1 - 2
Hydrogen Sulfide	7783-06-4	0 - 2
Benzene	71-43-2	0 - 1

### Section 3. Hazards Identification

Danger! Product May Contain or Release Hydrogen Sulfide. H<sub>2</sub>S is a highly toxic, highly flammable gas which can be fatal if inhaled at certain concentrations. Spent Metal Catalyst is a mixture of metals used in petroleum refining for hydrocracking and desulfurization. Due to confined space potential hazard, entrance into a sealed Sea Container or other confined space containing this product must be treated as an entry into a confined space. Oxygen levels must be checked to ensure safe human entry. This material may also off-gas hydrogen sulfide gas. It is also recommended that hydrogen sulfide level be tested prior to entry in to a confined space. Abrasive action may cause irritation of eyes & skin. Particles in air may be irritating to respiratory tract. Danger! Contains Benzene. Cancer Hazard. Can cause kidney, liver and blood disorders. May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard, can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Flammable liquid. Vapors may explode.

**Physical state** : Solid. (Granular solid. Powder.)

**Emergency overview** : Danger!

MAY BE FATAL IF INHALED, ABSORBED THROUGH SKIN OR SWALLOWED.

CAUSES SKIN BURNS.

CANCER HAZARD.

CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

CAUSES RESPIRATORY TRACT IRRITATION.

CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS:  
BLOOD, KIDNEYS, LUNGS, LIVER, LYMPHATIC SYSTEM, CARDIOVASCULAR  
SYSTEM, RESPIRATORY TRACT, SKIN, ADRENAL, CENTRAL NERVOUS SYSTEM,  
EYE, LENS OR CORNEA, NOSE, SINUSES.

Do not ingest. Do not get in eyes or on skin or clothing. Avoid breathing dust. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Risk of cancer depends on duration and level of exposure.

**Routes of entry** : Eye contact. Inhalation. Ingestion.

#### Potential acute health effects

**Eyes** : Irritating to eyes. Inflammation of the eye is characterized by redness, watering and itching.

**Skin** : May cause irritation to skin

**Inhalation** : Irritating to respiratory system. Possible risk of irreversible effects.

**Ingestion** : May cause burns to mouth, throat and stomach.

**Medical conditions aggravated by over-exposure** : Repeated skin exposure can produce local skin irritation. Repeated or prolonged exposure to the substance can produce lung damage.

**Over-exposure signs/symptoms** : No additional information.

See toxicological information (section 11)

## Section 4. First Aid Measures

- Eye contact** : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
- Skin contact** : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention.
- Inhalation** : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
- Ingestion** : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If potentially dangerous quantities of this material have been swallowed, call a physician immediately.

## Section 5. Fire Fighting Measures

- Flammability of the product** : May be combustible at high temperature.
- Flash point** : Not Available
- Flammable limits** : Not Available
- Products of combustion** : These products are carbon oxides (CO, CO<sub>2</sub>), nitrogen and sulfur oxides (NO<sub>x</sub>, SO<sub>x</sub>), particulate matter, VOC's.
- Fire-fighting media and instructions** : Combustible Solid. When heated it can burn in the open or confined spaces. Use dry chemical, carbon dioxide, foam, or water as preferred extinguishing media. Water can be used to cool fire- exposed containers, structures and to protect personnel. Use water to flush spills away from sources of ignition. Do not flush down public sewers.
- 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

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8).
- 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 Fire Fighting 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.
- Methods for cleaning up** : If emergency personnel are unavailable, vacuum or carefully scoop up spilled material and place in an appropriate container for disposal. Avoid creating dusty conditions and prevent wind dispersal.

## Section 7. Handling and Storage

- Handling** : Use only with adequate ventilation. Avoid breathing dust. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, or using toilet facilities.
- Storage** : Store in an appropriate container.

## Section 8. Exposure controls, personal protection

**Engineering controls** : Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fumes or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

### Personal protection

**Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

**Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory** : Use a properly fitted, particulate filter 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.

**Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

**Personal protective equipment (Pictograms)** : Consult your Supervisor or S.O.P. for special handling directions.



**Personal protection in case of a large spill** : Splash goggles. Full suit. Boots. Gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

### Component

Silicates, amorphous

Nickel Oxide

### Exposure limits

**NIOSH REL (United States, 12/2001).**

TWA: 6 mg/m<sup>3</sup> 10 hour/hours. Form: All forms

**ACGIH TLV (United States, 1/2006). Notes: as Ni**

**Substance identified by other sources as a suspected or confirmed human carcinogen. Adopted Values enclosed are those for which changes are proposed. Consult the Notice of Intended Changes for current proposal. See Notice of Intended changes.**

TWA: 0.2 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours. Form: Insoluble

**ACGIH TLV (United States, 1/2006). Notes: as Ni**

**Refers to Appendix A -- Carcinogens. Inhalable fraction. See Appendix C, paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract. 1998 Adoption.**

TWA: 0.1 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours. Form: Soluble

**NIOSH REL (United States, 12/2001). Notes: as Ni**

**See Appendix A - NIOSH Potential Occupational Carcinogen**

TWA: 0.015 mg/m<sup>3</sup> 65534 times per shift, 10 hour/hours.

**OSHA PEL (United States, 11/2006). Notes: as Ni**

TWA: 1 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.

**ACGIH TLV (United States, 1/2005). Notes: Refers to Appendix A -- Carcinogens. Inhalable fraction. See Appendix C, paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract. 1998 Adoption.**

TWA: 1.5 mg/m<sup>3</sup> 8 hour/hours. Form: Metallic form

**NIOSH REL (United States, 12/2001). Notes: See Appendix A -**

Nickel

**NIOSH Potential Occupational Carcinogen**TWA: 0.015 mg/m<sup>3</sup> 10 hour/hours. Form: All forms**OSHA PEL (United States, 8/1997).**TWA: 1 mg/m<sup>3</sup> 8 hour/hours. Form: All forms**ACGIH TLV (United States, 1/2006). Notes: as V2O5 1996 Adoption Substances for which there is a Biological Exposure Index or Indices Refers to Appendix A -- Carcinogens.**TWA: 0.05 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Dust and fumes**NIOSH REL (United States, 12/2001).**

CEIL: 0.05 MG/M3 0 times per shift, 15 minute/minutes. Form: Fume

**OSHA PEL (United States, 8/1997).**CEIL: 0.5 mg/m<sup>3</sup> 0 times per shift, Form: Respirable dust**NIOSH REL (United States, 12/2001). Notes: Note: The REL applies to all vanadium compounds except Vanadium metal and Vanadium carbide (see Ferrovandium dust).**CEIL: 0.05 mg/m<sup>3</sup> 15 minute/minutes. Form: Dust**OSHA PEL (United States, 8/1997).**CEIL: 0.1 mg/m<sup>3</sup> Form: FumeCEIL: 0.5 mg/m<sup>3</sup> Form: Respirable dust**ACGIH TLV (United States, 1/2006). Notes: as V2O5 1996 Adoption Substances for which there is a Biological Exposure Index or Indices Refers to Appendix A -- Carcinogens.**TWA: 0.05 mg/m<sup>3</sup> 8 hour/hours. Form: Dust and fumes**ACGIH TLV (United States, 1/2006). Notes: as Mo of contained respirable quartz**TWA: 3 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Insoluble**OSHA PEL (United States, 8/1997). Notes: as Mo**TWA: 15 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Total dust**ACGIH TLV (United States, 1/2006). Notes: as Mo of contained respirable quartz**TWA: 3 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Insoluble**ACGIH TLV (United States, 1/2006). Notes: 1996 Adoption Refers to Appendix A -- Carcinogens. The value is for total dust containing no asbestos and < 1% crystalline silica.**TWA: 10 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours.**NIOSH REL (United States, 12/2001). Notes: as Al**TWA: 5 mg/m<sup>3</sup> 0 times per shift, 10 hour/hours.**OSHA PEL (United States, 8/1997).**TWA: 5 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Respirable fractionTWA: 15 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Total dust**ACGIH TLV (United States, 9/2004).**TWA: 2 mg/m<sup>3</sup> 8 hour/hours. Form: All forms**NIOSH REL (United States, 6/2001).**TWA: 2 mg/m<sup>3</sup> 10 hour/hours. Form: All forms**OSHA PEL (United States, 6/1993).**TWA: 5 mg/m<sup>3</sup> 8 hour/hours. Form: All forms**ACGIH TLV (United States, 1/2006). Notes: as Co Substance identified by other sources as a suspected or confirmed human carcinogen. 1994-1995 Adoption Substances for which there is a Biological Exposure Index or Indices Refers to Appendix A -- Carcinogens.**TWA: 0.02 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Inorganic**ACGIH TLV (United States, 1/2006). Notes: as Co Substance identified by other sources as a suspected or confirmed human carcinogen. 1994-1995 Adoption Substances for which there is a Biological Exposure Index or Indices Refers to Appendix A -- Carcinogens.**

Vanadium

Vanadium Pentoxide

Molybdenum Trioxide

Molybdenum

Alumina

Calcium Oxide

Cobalt Oxide

Cobalt

TWA: 0.02 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Inorganic  
**NIOSH REL (United States, 12/2001). Notes: as Co**

TWA: 0.05 mg/m<sup>3</sup> 0 times per shift, 10 hour/hours. Form: Dust and fumes

**OSHA PEL (United States, 8/1997). Notes: as Co**

TWA: 0.1 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours.

**ACGIH TLV (United States, 1/2006). Notes: Refers to Appendix B -- Substances of Variable Composition. Respirable fraction; see Appendix C, paragraph C.**

TWA: 5 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Respirable fraction

**NIOSH REL (United States, 12/2001). Notes: as Fe**

TWA: 5 mg/m<sup>3</sup> 0 times per shift, 10 hour/hours. Form: Dust and fumes

**OSHA PEL (United States, 8/1997).**

TWA: 10 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours.

**ACGIH TLV (United States, 1/2006). Notes: Refers to Appendix A -- Carcinogens. Inhalable fraction. See Appendix C, paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract. ACGIH 2003 Adoption**

TWA: 10 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Fume

**OSHA PEL (United States, 8/1997).**

TWA: 15 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Total particulates

**ACGIH TLV (United States, 1/2005). Notes: Substance identified by other sources as a suspected or confirmed human carcinogen. 1994-1995 Adoption Refers to Appendix A -- Carcinogens.**

TWA: 0.5 mg/m<sup>3</sup> 8 hour/hours. Form: Inorganic

**NIOSH REL (United States, 12/2001). Notes: See Appendix C - Supplemental Exposure Limits**

TWA: 0.5 mg/m<sup>3</sup> 10 hour/hours. Form: All forms

**OSHA PEL (United States, 8/1997).**

TWA: 1 mg/m<sup>3</sup> 8 hour/hours. Form: All forms

**ACGIH TLV (United States, 1/2006). Notes: as As**

**Substance identified by other sources as a suspected or confirmed human carcinogen. Substances for which there is a Biological Exposure Index or Indices Substances for which the TLV is higher than the OSHA Permissible Exposure Limit (PEL) and/or the NIOSH Recommended Exposure Limit (REL). See CFR 58(124) :36338-33351, June 30, 1993, for revised OSHA PEL. Refers to Appendix A -- Carcinogens.**

TWA: 0.01 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.

**NIOSH REL (United States, 12/2001). Notes: as As**

**See Appendix A - NIOSH Potential Occupational Carcinogen**

CEIL: 0.002 mg/m<sup>3</sup> 65534 times per shift, 15 minute/minutes. Form: Inorganic

**OSHA PEL (United States, 11/2006). Notes: as As**

TWA: 10 ug/m<sup>3</sup> 65534 times per shift, 8 hour/hours.

**ACGIH TLV (United States, 1/2005). Notes: Substance identified by other sources as a suspected or confirmed human carcinogen. Substances for which there is a Biological Exposure Index or Indices Substances for which the TLV is higher than the OSHA Permissible Exposure Limit (PEL) and/or the NIOSH Recommended Exposure Limit (REL). See CFR 58(124) :36338-33351, June 30, 1993, for revised OSHA PEL. Refers to Appendix A -- Carcinogens.**

TWA: 0.01 mg/m<sup>3</sup> 8 hour/hours. Form: All forms

**NIOSH REL (United States, 12/2001). Notes: See Appendix A - NIOSH Potential Occupational Carcinogen**

Ferric Oxide

Magnesium Oxide

Chromium

Arsenic Pentoxide

Arsenic

Titanium Oxide	<p>CEIL: 0.002 mg/m<sup>3</sup> 15 minute/minutes. Form: Inorganic  <b>OSHA PEL (United States, 8/1997).</b>  TWA: 10 µg/m<sup>3</sup> 8 hour/hours. Form: All forms  <b>ACGIH TLV (United States, 1/2006). Notes: Substance identified by other sources as a suspected or confirmed human carcinogen. 1996 Adoption Substances for which the TLV is higher than the OSHA Permissible Exposure Limit (PEL) and/or the NIOSH Recommended Exposure Limit (REL). See CFR 58(124) :36338-33351, June 30, 1993, for revised OSHA PEL. Refers to Appendix A -- Carcinogens.</b>  TWA: 10 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours.  <b>OSHA PEL (United States, 8/1997).</b>  TWA: 15 mg/m<sup>3</sup> 0 times per shift, 8 hour/hours. Form: Total dust  <b>ACGIH TLV (United States, 1/2006). Notes: as Sb</b>  TWA: 0.5 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.  <b>OSHA PEL (United States, 11/2006). Notes: as Sb</b>  TWA: 0.5 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.  <b>ACGIH TLV (United States, 1/2006). Notes: as Sb</b>  TWA: 0.5 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.  <b>OSHA PEL (United States, 11/2006). Notes: as Sb</b>  TWA: 0.5 mg/m<sup>3</sup> 65534 times per shift, 8 hour/hours.  <b>NIOSH REL (United States, 12/2001). Notes: Note: The REL and PEL also apply to other Antimony compounds (as Sb).</b>  TWA: 0.5 mg/m<sup>3</sup> 65534 times per shift, 10 hour/hours.  <b>ACGIH TLV (United States, 9/2004).</b>  TWA: 10 ppm 8 hour/hours. Form: All forms  STEL: 15 ppm 15 minute/minutes. Form: All forms  <b>NIOSH REL (United States, 12/2001).</b>  CEIL: 10 ppm 10 minute/minutes. Form: All forms  <b>OSHA PEL Z2 (United States, 8/1997).</b>  CEIL: 20 ppm Form: All forms  AMP: 50 ppm 10 minute/minutes. Form: All forms  <b>NIOSH REL (United States, 6/2001). Notes: See Appendix A - NIOSH Potential Occupational Carcinogen</b>  STEL: 1 ppm 15 minute/minutes. Form: All forms  TWA: 0.1 ppm 10 hour/hours. Form: All forms  <b>ACGIH TLV (United States, 1/2006). Skin</b>  STEL: 2.5 ppm 15 minute/minutes. Form: All forms  TWA: 0.5 ppm 8 hour/hours. Form: All forms  <b>OSHA PEL (United States, 6/1993).</b>  STEL: 5 ppm 15 minute/minutes. Form: All forms  TWA: 1 ppm 8 hour/hours. Form: All forms</p>
Antimony Trioxide	
Antimony	
Hydrogen Sulfide	
Benzene	

Consult local authorities for acceptable exposure limits.

## Section 9. Physical and Chemical Properties

<b>Physical state</b>	: Solid. (Granular solid. Powder.)
<b>Color</b>	: Black.
<b>Odor</b>	: Faint odor.
<b>Specific gravity</b>	: 2.1 (Water = 1)
<b>Solubility</b>	: Not Soluble in Water

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## Section 10. Stability and reactivity data

- Stability and reactivity** : The product is stable.
- Hazardous decomposition products** : These products are carbon oxides (CO, CO<sub>2</sub>), nitrogen and sulfur oxides (NO<sub>x</sub>, SO<sub>x</sub>), particulate matter, VOC's.
- Hazardous polymerization** : Will not occur.

## Section 11. Toxicological Information

### Toxicity data

<u>Ingredient name</u>	<u>Test</u>	<u>Result</u>	<u>Route</u>	<u>Species</u>
Nickel	LDLo	500 mg/kg	Oral	Rat
	LDLo	5 mg/kg	Oral	Guinea pig
	LDLo	500 mg/kg	Oral	Mouse
Vanadium	LD50	10 mg/kg	Oral	Rat
	LD50	5 mg/kg	Oral	Mouse
	LD50	23.4 mg/kg	Oral	Mouse
	LD50	50 mg/kg	Dermal	Rabbit
Vanadium Pentoxide	LD50	10 mg/kg	Oral	Rat
	LD50	5 mg/kg	Oral	Mouse
	LD50	23.4 mg/kg	Oral	Mouse
	LD50	50 mg/kg	Dermal	Rabbit
Molybdenum Trioxide	LD50	2689 mg/kg	Oral	Rat
Petroleum Coke	LD50	>2000 mg/kg	Oral	Rat
Cobalt Oxide	LD50	202 mg/kg	Oral	Rat
	LDLo	89 mg/kg	Oral	Dog
Cobalt	LD50	6171 mg/kg	Oral	Rat
	LDLo	750 mg/kg	Oral	Rabbit
	LDLo	0.28 mg/kg	Oral	human
Arsenic Pentoxide	LD50	8 mg/kg	Oral	Rat
	LD50	55 mg/kg	Oral	Mouse
Arsenic	LD50	763 mg/kg	Oral	Rat
	LD50	144 mg/kg	Oral	Mouse
	LD50	145 mg/kg	Oral	Mouse
Antimony Trioxide	LD50	>34600 mg/kg	Oral	Rat
Hydrogen Sulfide	LC50	444 ppm (1 hour/hours)	Inhalation	Rat
	LC50	673 ppm (1 hour/hours)	Inhalation	Mouse
Benzene	LD50	930 mg/kg	Oral	Rat
	LD50	4700 mg/kg	Oral	Mouse
	LD50	5700 mg/kg	Oral	Mammal
	LD50	48 mg/kg	Dermal	Mouse
	LDLo	50 mg/kg	Oral	man

- Chronic effects on humans** : **CARCINOGENIC EFFECTS:** Classified 3 (Not classifiable for humans.) by IARC [Silicates, amorphous]. Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union [Nickel Oxide]. Classified + (Proven.) by NIOSH [Nickel]. Classified 2B (Possible for humans.) by IARC, 3 (Possible for humans.) by European Union [Nickel]. Classified 2 (Reasonably anticipated to be human carcinogens.) by NTP [Nickel]. Classified A5 (Not suspected for humans.) by ACGIH [Nickel]. Classified 2B (Possible for humans.) by IARC [Vanadium]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Vanadium]. Classified 2B (Possible for humans.) by IARC [Vanadium Pentoxide]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Vanadium Pentoxide]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Alumina]. Classified A3 (Proven for animals.) by ACGIH, 2B (Possible for humans.) by IARC [Cobalt Oxide]. Classified A3 (Proven for animals.) by

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ACGIH, 2B (Possible for humans.) by IARC [Cobalt]. Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [Ferric Oxide]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Magnesium Oxide]. Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [Chromium]. Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union [Arsenic Pentoxide]. Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH [Arsenic]. Classified 2B (Possible for humans.) by IARC [Titanium Oxide]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Titanium Oxide]. Classified 2B (Possible for humans.) by IARC, 3 (Possible for humans.) by European Union [Antimony Trioxide]. Classified A2 (Suspected for humans.) by ACGIH [Antimony Trioxide]. Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union [Benzene].

**MUTAGENIC EFFECTS:** Classified 3 by European Union [Vanadium Pentoxide]. Contains material which causes damage to the following organs: blood, kidneys, lungs, liver, lymphatic system, cardiovascular system, upper respiratory tract, skin, adrenal, central nervous system (CNS), eye, lens or cornea, nose/sinuses.

- Other toxic effects on humans** : Hazardous in case of skin contact (corrosive, sensitizer), of eye contact (corrosive), of inhalation (lung irritant, lung sensitizer, lung corrosive).
- Specific effects**
- Carcinogenic effects** : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
- Target organs** : Contains material which causes damage to the following organs: blood, kidneys, lungs, liver, lymphatic system, cardiovascular system, upper respiratory tract, skin, adrenal, central nervous system (CNS), eye, lens or cornea, nose/sinuses.

## Section 12. Ecological Information

### Ecotoxicity data

<u>Ingredient name</u>	<u>Species</u>	<u>Period</u>	<u>Result</u>
Nickel	Daphnia magna (EC50)	48 hour/hours	1 mg/l
	Pimephales promelas (LC50)	96 hour/hours	2.916 mg/l
	Pimephales promelas (LC50)	96 hour/hours	2.923 mg/l
	Pimephales promelas (LC50)	96 hour/hours	5.163 mg/l
	Pimephales promelas (LC50)	96 hour/hours	5.209 mg/l
	Pimephales promelas (LC50)	96 hour/hours	5.383 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.0018 mg/l
Vanadium	Daphnia magna (LC50)	96 hour/hours	0.85 mg/l
	Daphnia magna (LC50)	96 hour/hours	1.03 mg/l
	Pimephales promelas (LC50)	96 hour/hours	1.9 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.2 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	6.1 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.0018 mg/l
	Daphnia magna (LC50)	96 hour/hours	0.85 mg/l
Vanadium Pentoxide	Daphnia magna (LC50)	96 hour/hours	1.03 mg/l
	Pimephales promelas (LC50)	96 hour/hours	1.9 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.2 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	6.1 mg/l
	Daphnia magna (LC50)	96 hour/hours	32 mg/l
	Daphnia magna (LC50)	96 hour/hours	36.8 mg/l
	Pimephales promelas (LC50)	96 hour/hours	577 mg/l
Molybdenum Trioxide	Pimephales promelas (LC50)	96 hour/hours	678 mg/l

Continued on next page

Molybdenum	Oncorhynchus mykiss (LC50)	96 hour/hours	800 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	1320 mg/l
Chromium	Daphnia magna (EC50)	48 hour/hours	0.07 mg/l
	Pimephales promelas (LC50)	96 hour/hours	37 mg/l
	Pimephales promelas (LC50)	96 hour/hours	39 mg/l
	Pimephales promelas (LC50)	96 hour/hours	52 mg/l
	Daphnia pulex (LC50)	96 hour/hours	90.4 mg/l
	Cyprinus carpio (LC50)	96 hour/hours	93.6 mg/l
	Arsenic Pentoxide	Oncorhynchus mykiss (LC50)	96 hour/hours
Titanium Oxide	Pimephales promelas (LC50)	96 hour/hours	42 mg/l
	Daphnia magna (EC50)	48 hour/hours	>1000 mg/l
Antimony Trioxide	Selenastrum capricornutum (EC50)	48 hour/hours	0.74 mg/l
	Daphnia magna (EC50)	48 hour/hours	423.45 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	>440 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.007 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	0.007 mg/l
Hydrogen Sulfide	Pimephales promelas (LC50)	96 hour/hours	0.0071 mg/l
	Lepomis macrochirus (LC50)	96 hour/hours	0.009 mg/l
	Pimephales promelas (LC50)	96 hour/hours	0.0107 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	0.012 mg/l
	Daphnia magna (EC50)	48 hour/hours	9.23 mg/l
	Daphnia magna (EC50)	48 hour/hours	10 mg/l
	Daphnia magna (EC50)	48 hour/hours	11.73 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.3 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	5.9 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	9.2 mg/l

**Products of degradation** : Carbon oxides (CO, CO<sub>2</sub>), water, nitrogen oxides (NO, NO<sub>2</sub> etc.), sulfur oxides (SO<sub>2</sub>, SO<sub>3</sub> etc.), halogenated compounds and phosphates.


**Toxicity of the products of biodegradation** : The product itself and its products of degradation are not toxic.

## Section 13. Disposal Considerations

**Waste disposal** : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. 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.

Consult your local or regional authorities.

## Section 14. Transport Information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
<b>DOT Classification</b>	3077	Waste Environmentally Hazardous Substance Solid, N.O.S. (K171)	9	III		-
<b>TDG Classification</b>						-

## Section 15. Regulatory Information

### United States

**U.S. Federal regulations** : TSCA 8(a) PAIR: Vanadium; Vanadium Pentoxide  
 TSCA 8(b) inventory: Silicates, amorphous; Alumina; Calcium Oxide; Magnesium Oxide; Titanium Oxide; Sodium Oxide; Molybdenum Trioxide; Molybdenum; Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Phosphorus Pentoxide; Chromium; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Potassium Oxide; Potassium; Ferric Oxide; Benzene; Hydrogen Sulfide; Petroleum Coke  
 SARA 302/304/311/312 extremely hazardous substances: Vanadium; Vanadium Pentoxide; Arsenic Pentoxide; Hydrogen Sulfide  
 SARA 302/304 emergency planning and notification: Vanadium; Vanadium Pentoxide; Arsenic Pentoxide; Hydrogen Sulfide  
 SARA 302/304/311/312 hazardous chemicals: Silicates, amorphous; Alumina; Calcium Oxide; Magnesium Oxide; Titanium Oxide; Sodium Oxide; Molybdenum Trioxide; Molybdenum; Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Phosphorus Pentoxide; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Potassium Oxide; Potassium; Ferric Oxide; Benzene; Hydrogen Sulfide  
 SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Silicates, amorphous: Delayed (chronic) health hazard; Alumina: Immediate (acute) health hazard; Calcium Oxide: Immediate (acute) health hazard; Magnesium Oxide: Immediate (acute) health hazard; Titanium Oxide: Immediate (acute) health hazard; Sodium Oxide: Immediate (acute) health hazard; Molybdenum Trioxide: Immediate (acute) health hazard; Molybdenum: Immediate (acute) health hazard, Delayed (chronic) health hazard; Cobalt Oxide: Immediate (acute) health hazard, Delayed (chronic) health hazard; Cobalt: Delayed (chronic) health hazard; Nickel Oxide: Delayed (chronic) health hazard; Nickel: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; Vanadium: Immediate (acute) health hazard, Delayed (chronic) health hazard; Vanadium Pentoxide: Immediate (acute) health hazard; Phosphorus Pentoxide: Immediate (acute) health hazard; Antimony Trioxide: Delayed (chronic) health hazard; Antimony: Immediate (acute) health hazard, Delayed (chronic) health hazard; Arsenic Pentoxide: Immediate (acute) health hazard, Delayed (chronic) health hazard; Arsenic: Delayed (chronic) health hazard; Potassium Oxide: Immediate (acute) health hazard; Potassium: Fire hazard, reactive, Immediate (acute) health hazard; Ferric Oxide: Delayed (chronic) health hazard; Benzene: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; Hydrogen Sulfide: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard  
 Clean Water Act (CWA) 307: Nickel Oxide; Nickel; Chromium; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Benzene  
 Clean Water Act (CWA) 311: Vanadium; Vanadium Pentoxide; Antimony Trioxide; Arsenic Pentoxide; Benzene  
 Clean Air Act (CAA) 112 accidental release prevention: Hydrogen Sulfide  
 Clean Air Act (CAA) 112 regulated flammable substances: No products were found.  
 Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen Sulfide

### SARA 313

#### **Form R - Reporting requirements**

<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
: Nickel Oxide	1313-99-1	2 - 30
Nickel	7440-02-0	2 - 30
Vanadium	7440-62-2	2 - 30
Molybdenum Trioxide	1313-27-5	1 - 20
Alumina	1344-28-1	2 - 10
Cobalt Oxide	1307-96-6	0.1 - 7
Cobalt	7440-48-4	0.1 - 7
Chromium	7440-47-3	0.1 - 3
Arsenic Pentoxide	1303-28-2	0.1 - 3
Arsenic	7440-38-2	0.1 - 3
Antimony Trioxide	1309-64-4	0.1 - 2

*Continued on next page*

	Antimony	7440-36-0	0.1 - 2
	Hydrogen Sulfide	7783-06-4	0 - 2
	Benzene	71-43-2	0 - 1
<b>Supplier notification</b>	: Nickel Oxide	1313-99-1	2 - 30
	Nickel	7440-02-0	2 - 30
	Vanadium	7440-62-2	2 - 30
	Molybdenum Trioxide	1313-27-5	1 - 20
	Alumina	1344-28-1	2 - 10
	Cobalt Oxide	1307-96-6	0.1 - 7
	Cobalt	7440-48-4	0.1 - 7
	Chromium	7440-47-3	0.1 - 3
	Arsenic Pentoxide	1303-28-2	0.1 - 3
	Arsenic	7440-38-2	0.1 - 3
	Antimony Trioxide	1309-64-4	0.1 - 2
	Antimony	7440-36-0	0.1 - 2
	Hydrogen Sulfide	7783-06-4	0 - 2
	Benzene	71-43-2	0 - 1

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

<b>State regulations</b>	: Connecticut carcinogen reporting list.: Benzene
	Connecticut hazardous material survey.: Benzene
	Illinois toxic substances disclosure to employee act: Benzene
	Rhode Island RTK hazardous substances: Benzene
	Pennsylvania RTK: Silicates, amorphous: (generic environmental hazard); Alumina: (environmental hazard, generic environmental hazard); Calcium Oxide: (generic environmental hazard); Magnesium Oxide: (generic environmental hazard); Titanium Oxide: (generic environmental hazard); Molybdenum Trioxide: (environmental hazard, generic environmental hazard); Molybdenum: (generic environmental hazard); Cobalt Oxide: (environmental hazard, generic environmental hazard); Cobalt: (environmental hazard, generic environmental hazard); Nickel Oxide: (special hazard, environmental hazard, generic environmental hazard); Nickel: (special hazard, environmental hazard, generic environmental hazard); Vanadium: (environmental hazard, generic environmental hazard); Vanadium Pentoxide: (environmental hazard, generic environmental hazard); Phosphorus Pentoxide: (environmental hazard, generic environmental hazard); Chromium: (special hazard, environmental hazard, generic environmental hazard); Antimony Trioxide: (environmental hazard, generic environmental hazard); Antimony: (environmental hazard, generic environmental hazard); Arsenic Pentoxide: (special hazard, environmental hazard, generic environmental hazard); Arsenic: (special hazard, environmental hazard, generic environmental hazard); Potassium: (generic environmental hazard); Ferric Oxide: (environmental hazard, generic environmental hazard); Benzene: (special hazard, environmental hazard, generic environmental hazard); Hydrogen Sulfide: (environmental hazard, generic environmental hazard)
	Florida: Benzene
	Michigan critical material: Benzene
	Massachusetts RTK: Silicates, amorphous; Alumina; Calcium Oxide; Magnesium Oxide; Titanium Oxide; Molybdenum Trioxide; Molybdenum; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Phosphorus Pentoxide; Chromium; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Potassium; Ferric Oxide; Benzene; Hydrogen Sulfide
	New Jersey: Silicates, amorphous; Alumina; Calcium Oxide; Magnesium Oxide; Titanium Oxide; Sodium Oxide; Molybdenum Trioxide; Molybdenum; Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Phosphorus Pentoxide; Chromium; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Potassium Oxide; Potassium; Ferric Oxide; Benzene; Hydrogen Sulfide

**WARNING:** This product contains chemical/chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.: Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Antimony Trioxide; Arsenic Pentoxide; Arsenic; Benzene

**WARNING:** This product contains chemical/chemicals known to the state of California to cause reproductive harm (female).: No products were found.

**WARNING:** This product contains chemical/chemicals known to the state of California to cause reproductive harm (male).: Benzene

California prop. 65 (no significant risk level): Arsenic: 0.06 µg/day (inhalation); Benzene: 6.4 µg/day (ingestion), 13 µg/day (inhalation)

California prop. 65 (Maximum Acceptable Dosage Level): Benzene: 24 µg/day (ingestion), 49 µg/day (inhalation)

**WARNING:** This product contains chemical/chemicals known to the state of California to cause birth defects or other reproductive harm.: Benzene

**WARNING:** This product contains chemical/chemicals known to the state of California to cause cancer.: Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Antimony Trioxide; Arsenic Pentoxide; Arsenic; Benzene

## Canada

### WHMIS (Canada)

- : Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
- Class D-2A: Material causing other toxic effects (Very toxic).
- Class D-2B: Material causing other toxic effects (Toxic).
- Class E: Corrosive material

CEPA DSL: Silicates, amorphous; Alumina; Calcium Oxide; Magnesium Oxide; Titanium Oxide; Sodium Oxide; Molybdenum Trioxide; Molybdenum; Cobalt Oxide; Cobalt; Nickel Oxide; Nickel; Vanadium; Vanadium Pentoxide; Phosphorus Pentoxide; Chromium; Antimony Trioxide; Antimony; Arsenic Pentoxide; Arsenic; Potassium Oxide; Potassium; Ferric Oxide; Hydrogen Sulfide; Petroleum Coke

## Section 16. Other Information

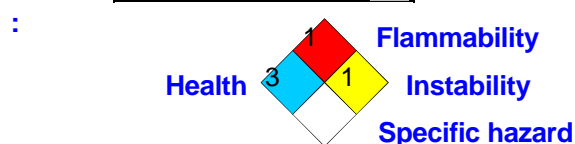
### Label requirements

- : MAY BE FATAL IF INHALED, ABSORBED THROUGH SKIN OR SWALLOWED.
- CAUSES SKIN BURNS.
- CANCER HAZARD.
- CONTAINS MATERIAL WHICH CAN CAUSE CANCER.
- CAUSES RESPIRATORY TRACT IRRITATION.
- CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: BLOOD, KIDNEYS, LUNGS, LIVER, LYMPHATIC SYSTEM, CARDIOVASCULAR SYSTEM, RESPIRATORY TRACT, SKIN, ADRENAL, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA, NOSE, SINUSES.

### Hazardous Material Information System (U.S.A.)

Health	3
Fire hazard	1
Physical Hazard	1
Personal protection	

### National Fire Protection Association (U.S.A.)



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## Definitions of Material Safety Data Sheet Terminology

### GOVERNMENT AGENCIES AND PRIVATE ASSOCIATIONS

**ACGIH** - American Conference of Governmental Industrial Hygienists, (private association)  
**DOT** - United States Department of Transportation  
**EPA** - United States Environmental Protection Agency  
**IARC** - International Agency for Research on Cancer, (private association)  
**NFPA** - National Fire Protection Association, (private association)  
**MSHA** - Mine Safety and Health Administration, U.S. Department of Labor  
**NIOSH** - National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services  
**NTP** - National Toxicology Program, (private association)  
**OSHA** - Occupational Safety and Health Administration, U.S. Department of Labor  
**WHMIS** - Workplace Hazardous Material Information System  
**CSA** - Canadian Standards Association

### HAZARD AND EXPOSURE INFORMATION

**Acute Hazard** - An adverse health effect which occurs rapidly as a result of short term exposure.  
**CAS #** - American Chemical Society's Chemical Abstract service registry number which identifies the product and/or ingredients.  
**Ceiling** - The concentration that should not be exceeded during any part of the working exposure  
**Chronic Hazard** - An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration  
**Fire Hazard** - A material that poses a physical hazard by being flammable, combustible, pyrophoric or an oxidizer as defined by 29 CFR 1910.1200  
**Hazard Class** - DOT hazard classification  
**Hazardous Ingredients** - Names of ingredients which have been identified as health hazards  
**IDLH** - Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitating or irreversible health effects. Established by NIOSH.  
**mg/m<sup>3</sup>** - Milligrams of contaminant per cubic meter of air, a mass to volume ratio  
**N/A** - Not available or no relevant information found  
**NA** - Not applicable  
**PEL** - OSHA permissible exposure limit; an action level of one half this value may be applicable  
**ppm** - Part per million (one volume of vapor or gas in one million volumes of air)  
**Pressure Hazard** - A material that poses a physical hazard due to the potential of a sudden release of pressure such as explosive or a compressed gas as defined by 29 CFR 1910.1200  
**Reactive Hazard** - A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200.  
**STEL** - The ACGIH Short-Term Exposure Limit, a 15-minute Time-Weighted Average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV.  
**TLV** - ACGIH Threshold Limit Value, represented herein as an 8-hour TWA concentration.  
**8-hour TWA** - The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.  
**LD50** - Single dose of a substance that, when administered by a defined route in an animal assay, is expected to cause the death of 50% of the defined animal population.

Continued on next page

**LC50** - The concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay, is expected to cause the death of 50% of a defined animal population.