

1. Identification

Product identifier

Product Identity 80/20, 50/50, and 65/35 Vanadium-Titanium Mixes (CAB Catalysts)

Other means of identification Vanadium-Titanium Mixes (CAB Catalysts)

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

Vanadium Titanium Mix (VTi) is used as a catalyst in polyethylene production.

Application Method

See Technical Data Sheet.

Details of the supplier of the safety data sheet**Company Name**

US Vanadium, LLC
4285 Malvern Road
Hot Springs, Arkansas 71901

Emergency**CHEMTREC (USA)**

(800) 424-9300

24 hour Emergency Telephone No.

US Vanadium, LLC: +1-501-262-1270

Customer Service: US Vanadium, LLC

NATIONAL RESPONSE CENTER: +1-800-424-8802
CHEMTREC U.S. and CANADA: +1-800-424-9300
CHEMTREC International: +1-202-483-7616 (Collect)

2. Hazard(s) identification

Classification of the substance or mixture

Met. Corr. 1;H290	May be corrosive to metals.
Acute Tox. 3;H301	Toxic if swallowed.
Acute Tox. 3;H311	Toxic in contact with skin
Acute Tox. 3;H331	Toxic if inhaled.
Skin Corr. 1B;H314	Causes severe skin burns and eye damage.
STOT SE 1;H370	Causes damage to organs. Specific Target Organs: (Not Available)
STOT RE 1;H372	Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Not Available)
Aquatic Chronic 2;H411	Toxic to aquatic life with long lasting effects.

Label elements**Danger**

H301 Toxic if swallowed.

H311 Toxic in contact with skin.

H314 Causes severe skin burns and eye damage.

H331 Toxic if inhaled.

H370 Causes damage to organs.

H372 Causes damage to organs through prolonged or repeated exposure.

H411 Toxic to aquatic life with long lasting effects.

[Prevention]:

P234 Keep only in original container.

P260 Do not breathe dust, fume, mist, vapors or spray.

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

P273 Avoid release to the environment.

P280 Wear protective gloves, eye protection, face protection.

P284 Wear respiratory protection.

[Response]:

P301+310 IF SWALLOWED: Immediately call a POISON CENTER, doctor or physician.

P303+361+353 IF ON SKIN (or hair): Remove, take off immediately all contaminated clothing. Rinse skin with water, shower.

P304+340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305+351+338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

P308+311 If exposed or concerned: Call a POISON CENTER, doctor or physician.

P314 Get Medical advice or attention if you feel unwell.

P390 Absorb spillage to prevent material damage.

[Storage]:

P403+233 Store in a well ventilated place. Keep container tightly closed.

P405 Store locked up.

P406 Store in a corrosive resistant, container with a resistant inner liner.

[Disposal]:

P501 Dispose of contents or container in accordance with local and national regulations.

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the Hazardous Products Regulations.

Ingredient/Chemical Designations	Weight %	GHS Classification	Notes
Titanium chloride CAS Number: 0007550-45-0 Synonyms: Titanium chloride, TITANIUM CHLORIDE (TiCl ₄), Titanium tetrachloride	20 - 50	Skin Corr. 1B;H314 Acute Tox. 1;H330 STOT SE 1;H370 STOT RE 1;H372 Acute Tox. 4;H302 Met. Corr. 1;H290	[1]
Vanadium oxytrichloride CAS Number: 0007727-18-6 Synonyms: Vanadium oxytrichloride	50 - 80	Skin Corr. 1C;H314 Eye Dam. 1;H318 Acute Tox. 3;H301 Aquatic Chronic 2;H411	[1]

[1] Substance with a health or environmental hazard.

[2] Substance with a workplace exposure limit.

[3] PBT-substance or vPvB-substance.

*The full texts of the phrases are shown in Section 16.

Section 4. First aid measures

Description of first aid measures

General	In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.
Inhalation	Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious, place in the recovery position and obtain immediate medical attention. Give nothing by mouth.
Eyes	Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.
Skin	Remove contaminated clothing. Dab liquid from skin using DRY cotton or paper toweling. Flood area with plenty of the coldest water available. See a physician if exposure symptoms develop.
Ingestion	If swallowed obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

Most important symptoms and effects, both acute and delayed

Overview	Eye Contact: Chemical and possible thermal burns with redness, swelling, corneal burns, and possible blindness. Skin Contact: Liquid causes chemical burns with redness, swelling, blisters, and pain, vapors and fumes may cause chemical burns. Inhalation: Fumes cause chemical burns of nasal passages, throat, and respiratory tract, with coughing, chest pain, and breathing difficulty. Ingestion: Chemical and possible thermal burns of the mouth, throat, stomach, and intestinal tract, with injury to liver and kidneys. Treat symptomatically. See section 2 for further details.
Inhalation	Toxic if inhaled. Causes damage to organs.
Skin	Causes severe skin burns and eye damage.
Ingestion	Toxic if swallowed.

Indication of any immediate medical attention and special treatment needed

No further relevant information available.

Section 5. Fire-fighting measures

Extinguishing media

Not flammable. Use media suitable for surrounding fire.

Special hazards arising from the substance or mixture

Dense fumes of product, vanadium pentoxide, titanium dioxide, and hydrochloric acid. Product reacts exothermically with water to form hydrochloric acid, vanadium pentoxide, and titanium dioxide.

Hazardous decomposition: Violently hygroscopic, forming vanadium pentoxide, titanium dioxide, and hydrochloric acid. May generate chlorine on heating.

Do not breathe dust, fume, mist, vapors or spray.

Advice for fire-fighters

Impermeable acid-resistant clothing. Positive-pressure, self-contained breathing apparatus.

Cool containers immersed in fire by blanketing with cold water. Product reacts violently with water, releasing dense corrosive fumes. Avoid water contact with product unless necessary.

The pressure in closed-product containers exposed to fire can build to dangerous levels. Direct extinguishing media to such containers to keep them cool. Shipping container vapors space contains a fusible plug, which melts between 75 and 175°C (165 and 350°F) and a relief valve which opens at 11.9 bar (175 psi).

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Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

Dense fumes of product, vanadium pentoxide, titanium dioxide, and hydrochloric acid. Product reacts exothermically with water to form hydrochloric acid, vanadium pentoxide, and titanium dioxide.

Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

Methods and material for containment and cleaning up

Dense fumes of product, vanadium pentoxide, titanium dioxide, and hydrochloric acid. Product reacts exothermically with water to form hydrochloric acid, vanadium pentoxide, and titanium dioxide.

Evacuate the area immediately. Cleanup personnel must wear impermeable acid-resistant clothing, including positive-pressure, self-contained breathing apparatus.

Prevent water and moisture contact. Product fumes in air from reaction with atmospheric moisture. Fumes are a mixture of vanadium pentoxide, titanium dioxide, and hydrochloric acid. Vanadium pentoxide is a U.S. EPA-listed hazardous substance with a reportable quantity of 454 kg (1000 lbs.). Titanium tetrachloride is a U.S. EPA-listed hazardous air pollutant (HAP) with a report-able quantity of 0.6 kg (1 lb.).

Minor spills can be misted with water and neutralized with soda ash. Dike large spills with clay, earth, or soda ash. Pump or absorb with dry clay and shovel up to a dry polyethylene container. Steel or aluminum may react and dissolve.

Product may be neutralized in place using foam and soda ash. Vanadium-pentoxide fume has an OSHA PEL of 0.1 mg/m³. Titanium dioxide has an OSHA PEL of 15 mg/m³. Shipping-container vapor space is fitted with a fusible plug, which melts between 75 and 175°C (165 and 350 ° F), or a reclosing relief valve which opens at 110% of the container MAWP.

Section 7. Handling and storage

Precautions for safe handling

Handling: Do not allow contact with moisture. Use only in a closed system. Do not open the container to the atmosphere. Use only approved materials of construction.

Storage: Store in a closed steel container under a dry inert gas blanket. Storage area should be well ventilated. Protect containers from temperature cycling which may cause breathing.

See section 2 for further details. - [Prevention]:

Conditions for safe storage, including any incompatibilities

Incompatible materials: Water, sodium, polar solvents, most plastics, aluminum.

See section 2 for further details. - [Storage]:

Specific end use(s)

Section 8. Exposure controls / personal protection
Control parameters

CAS No.	Ingredient	Exposure	
		Source	Value
0007550-45-0	Titanium chloride	ACGIH	No Established Limit
		Alberta	No Established Limit
		British Columbia	No Established Limit
		Manitoba	No Established Limit
		New Brunswick	No Established Limit
		Newfoundland and Labrador	No Established Limit
		Nova Scotia	No Established Limit
		Northwest Territories	No Established Limit
		Nunavut	No Established Limit
		Ontario	No Established Limit
		Prince Edward Island	No Established Limit
		Quebec	No Established Limit
		Saskatchewan	No Established Limit
		Yukon	No Established Limit
		0007727-18-6	Vanadium oxytrichloride
Alberta	No Established Limit		
British Columbia	No Established Limit		
Manitoba	No Established Limit		
New Brunswick	No Established Limit		
Newfoundland and Labrador	No Established Limit		
Nova Scotia	No Established Limit		
Northwest Territories	No Established Limit		
Nunavut	No Established Limit		
Ontario	No Established Limit		
Prince Edward Island	No Established Limit		
Quebec	No Established Limit		
Saskatchewan	No Established Limit		
Yukon	No Established Limit		

Exposure controls
Respiratory

Use full-face gas mask approved by NIOSH/MSHA; self-contained breathing apparatus.

Eyes

Use goggles, face-mask, face shield; do not wear contact lenses.

Skin

Use chemically acid-resistant clothing and boots. Use nitrile or natural-rubber gloves.

Engineering Controls

Ensure sufficient ventilation of the workplace. Use recommended materials of construction. Use design and operational practices which exclude atmosphere and moisture contact.

Other Work Practices Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details.

Section 9. Physical and chemical properties

Appearance	Pale Yellow Clear Liquid
Odor	Acrid
Odor threshold	Not determined
pH	Not Available
Melting point / freezing point	Not Available
Initial boiling point and boiling range	128°C (261°F)
Flash Point	Not Flammable
Evaporation rate (Ether = 1)	Not Available
Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	Lower Explosive Limit: Not Available Upper Explosive Limit: Not Available
Vapor pressure (Pa)	17.5 mm Hg (20°C)
Vapor Density	Not Available
Relative Density	Not Available
Solubility in Water	Violently hygroscopic; decomposes to hydrochloric acid, vanadium pentoxide, and titanium dioxide.
Partition coefficient n-octanol/water (Log Kow)	Not Available
Auto-ignition temperature	Not Available
Decomposition temperature	Not Available
Viscosity (cSt)	Not Available
Bulk Density	1.8
Oxidizing Properties	Acts as a catalyst in certain chemical environments.
Other information	No other relevant information.

Section 10. Stability and reactivity

Reactivity

Hazardous Polymerization will not occur.

Chemical stability

Stable under normal circumstances.

Possibility of hazardous reactions

No data available.

Conditions to avoid

Contact with water in any form.

Incompatible materials

Water, sodium, polar solvents, most plastics, aluminum.

Hazardous decomposition products

Violently hygroscopic, forming vanadium pentoxide, titanium dioxide, and hydrochloric acid. May generate chlorine on heating.

Section 11. Toxicological information

Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm
Titanium chloride - (7550-45-0)	460 mg/kg (rat)	3160 mg/kg (rabbit)	.46 mg/l (rat)	No data available	No data available
Vanadium oxytrichloride - (7727-18-6)	140 mg/kg (rat)	383 mg/kg (rat)	No data available	No data available	No data available

Carcinogen Data

CAS No.	Ingredient	Source	Value
0007550-45-0	Titanium chloride	IARC	Group 1: No; Group 2a: No; Group 2b: No; Group 3: No; Group 4: No;
		ACGIH	No Established Limit
0007727-18-6	Vanadium oxytrichloride	IARC	Group 1: No; Group 2a: No; Group 2b: No; Group 3: No; Group 4: No;
		ACGIH	No Established Limit

Classification	Category	Hazard Description
Acute toxicity (oral)	3	Toxic if swallowed.
Acute toxicity (dermal)	3	Toxic in contact with skin
Acute toxicity (inhalation)	3	Toxic if inhaled.
Skin corrosion/irritation	1B	Causes severe skin burns and eye damage.
Serious eye damage/irritation	1	Causes serious eye damage
Respiratory sensitization	---	Not Applicable
Skin sensitization	---	Not Applicable
Germ cell mutagenicity	---	Not Applicable
Carcinogenicity	---	Not Applicable
Reproductive toxicity	---	Not Applicable
STOT-single exposure	1	Causes damage to organs.
STOT-repeated exposure	1	Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	---	Not Applicable

Possible routes of entry: No data available.

Symptoms and effects, both acute and delayed:

Eye Contact: Chemical and possible thermal burns with redness, swelling, corneal burns, and possible blindness.

Skin Contact: Liquid causes chemical burns with redness, swelling, blisters, and pain. Vapors and fumes may cause chemical burns.

Inhalation: Fumes cause chemical burns of nasal passages, throat, and respiratory tract, with coughing, chest pain, and breathing difficulty.

Ingestion: Chemical and possible thermal burns of the mouth, throat, stomach, and intestinal tract, with injury to liver and kidneys. Treat symptomatically.

Inhalation Fatal if inhaled. Causes damage to organs.

Skin Causes severe skin burns and eye damage.

Ingestion Toxic if swallowed.

Section 12. Ecological information

Toxicity

Toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

Violently reacts with water forming vanadium pentoxide, titanium oxychloride, and hydrochloric acid, any of which may be harmful to an aquatic environment.

Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
Titanium chloride - (7550-45-0)	Not Available	Not Available	Not Available
Vanadium oxytrichloride - (7727-18-6)	Not Available	Not Available	Not Available

Persistence and degradability

There is no data available on the preparation itself.

Bioaccumulative potential

Not Available

Mobility in soil

No data available.

Results of PBT and vPvB assessment

This product contains no PBT/vPvB chemicals.

Other adverse effects

No data available.

Section 13. Disposal considerations

Waste treatment methods

Neutralize by slowly reacting with an alkaline solution, preferably lime or sodium hydroxide. Dispose of resulting solution in accordance with local regulatory guidelines

Rinse with alkaline solution, preferably sodium hydroxide. Dispose of rinseate and cleaned packaging in accordance with local regulatory guidelines.

Section 14. Transport information

Classification Method: Classified as per Part 2, Sections 2.1 – 2.8 of the Transportation of Dangerous Goods Regulations.

	TDG (Domestic Surface Transportation)	IMO / IMDG (Ocean Transportation)	ICAO/IATA
UN number	UN3390	UN3390	UN3390
UN proper shipping name	UN3390, Toxic by inhalation liquid, corrosive, n.o.s., (Vanadium Oxytrichloride, Titanium Tetrachloride), 6.1, I	Toxic by inhalation liquid, corrosive, n.o.s., (Vanadium Oxytrichloride, Titanium Tetrachloride)	Toxic by inhalation liquid, corrosive, n.o.s., (Vanadium Oxytrichloride, Titanium Tetrachloride)
Transport hazard class(es)	TDG Hazard Class: 6.1	IMDG: 6.1 Sub Class: Not Applicable	Air Class: 6.1

Packing group**Environmental hazards****IMDG** Marine Pollutant: Yes; (Vanadium oxytrichloride)**Special precautions for user**

Not Applicable

Section 15. Regulatory information

This product has been classified in accordance with the hazard criteria Hazardous Products Regulations (SOR/2015-17) and the SDS contains all of the information required by those regulations.

Canadian Domestic Substance List (DSL):

Titanium chloride

Vanadium oxytrichloride

Canadian Non-Domestic Substance List (NDSL):

To the best of our knowledge, there are no chemicals at levels, which require reporting under this statute.

Section 16. Other information

SDS Revision Date 08/05/2019

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H290 May be corrosive to metals.

H301 Toxic if swallowed.

H311 Toxic in contact with skin.

H302 Harmful if swallowed.

H314 Causes severe skin burns and eye damage.

H318 Causes serious eye damage.

H331 Toxic if inhaled.

H370 Causes damage to organs.

H372 Causes damage to organs through prolonged or repeated exposure.

H411 Toxic to aquatic life with long lasting effects.

US Vanadium, LLC. believes that the data on this sheet are correct as of the effective date and that the opinions given reflect those of qualified experts. Since US Vanadium, LLC cannot control the product or its use, it is the user's responsibility to use the product safely. The data on this sheet apply only to products sold by corporate sub-sidiaries of US Vanadium, LLC and may not apply to products sold by others.

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