

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

1.1. Product identifier

Product form : Mixture
 Name : Mixture VOCl₃ / TiCl₄ 50/50
 Trade name : CAB-2 Catalyst

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

1.2.1. Relevant identified uses

Use of the substance/mixture : Synthesis intermediate

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

MSSA S.A.S.
 111, Rue de la Volta - Pomblière
 73600 SAINT-MARCEL - France
 T +33 (0)4 79 24 70 70 - F +33 (0)4 79 24 70 50
fds-msds@metauxspeciaux.fr

1.4. Emergency telephone number

Emergency number : Chemtrec (USA only) : 1-800-424-9300

Country	Organisation/Company	Address	Emergency number	Comment
United Kingdom	National Poisons Information Service (Birmingham Centre) City Hospital, Guy's & St Thomas' Hospital Trust	Dudley Road B18 7QH Birmingham	0844 892 0111 (UK only, Monday to Friday, 08.00 to 18.00 hours)	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Acute Tox. 2 (Inhalation:vapour) H330
 Skin Corr. 1B H314
 STOT SE 1 H370
 STOT RE 1 H372
 Aquatic Chronic 2 H411

Full text of hazard classes and H-statements : see section 16

Adverse physicochemical, human health and environmental effects

Fatal if inhaled. Causes severe skin burns and eye damage. Corrosive to the respiratory tract. Causes damage to organs (lungs) (if inhaled). Causes damage to organs (lungs) through prolonged or repeated exposure (if inhaled). Reacts violently with water. Contact with water liberates toxic gas. Toxic to aquatic life with long lasting effects.

2.2. Label elements

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

Hazard pictograms (CLP) :



Signal word (CLP) : Danger

Hazardous ingredients : Vanadium trichloride oxide; titanium tetrachloride

Hazard statements (CLP) : H314 - Causes severe skin burns and eye damage
 H330 - Fatal if inhaled
 H370 - Causes damage to organs (lungs) (if inhaled)
 H372 - Causes damage to organs (lungs) through prolonged or repeated exposure (if inhaled)
 H411 - Toxic to aquatic life with long lasting effects

Precautionary statements (CLP) : P260 - Do not breathe vapours, spray, mist

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P273 - Avoid release to the environment
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P304+P340 - IF INHALED: remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P403+P233 - Store in a well-ventilated place. Keep container tightly closed

EUH-statements

: EUH014 - Reacts violently with water
EUH029 - Contact with water liberates toxic gas
EUH071 - Corrosive to the respiratory tract

2.3. Other hazards

No additional information available

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Vanadium trichloride oxide	(CAS No) 7727-18-6 (EC no) 231-780-2 (REACH-no) 01-2119980618-23-0000	50	Skin Corr. 1C, H314 Aquatic Chronic 2, H411
titanium tetrachloride	(CAS No) 7550-45-0 (EC no) 231-441-9 (EC index no) 022-001-00-5 (REACH-no) 01-2119485015-41	50	Acute Tox. 2 (Inhalation:vapour), H330 Skin Corr. 1B, H314 STOT SE 1, H370 STOT RE 1, H372

Full text of H-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Do not attempt to take action without suitable protective equipment. In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Give artificial respiration if necessary. Immediately call a POISON CENTER or doctor/physician.

First-aid measures after skin contact : Immediately remove contaminated clothing or footwear. Rinse immediately with plenty of water. Be careful, the product may remain trapped under clothing, footwear or a wrist-watch. If skin burns appear, call a doctor immediately.

First-aid measures after eye contact : Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Remove contact lenses, if present and easy to do. Continue rinsing. Consult an eye specialist immediately, even if there are no immediate symptoms.

First-aid measures after ingestion : Do not induce vomiting. Give nothing to eat or drink. Rinse mouth out with water. Give activated charcoal. Call a physician immediately. If possible show him this sheet. Failing this, show him the packaging or label. On ingestion in large quantities: Transfer to hospital rapidly.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Corrosive to respiratory system. Causes burns. Risk of lung oedema.
Symptoms/injuries after skin contact : Burns. Ulcerations. Bleeding. Bloody scabs.
Symptoms/injuries after eye contact : Burns. Serious damage to eyes.
Symptoms/injuries after ingestion : Corrosion or irritation of the linings of the mouth, throat, and gastrointestinal tract.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide (CO₂). Powder.
Unsuitable extinguishing media : Water.

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5.2. Special hazards arising from the substance or mixture

Explosion hazard : Heating will cause a rise in pressure with a risk of bursting.
Hazardous decomposition products in case of fire : hydrogenchloride. Divanadium pentaoxide.

5.3. Advice for firefighters

Firefighting instructions : Contain the extinguishing fluids by bunding.
Protection during firefighting : Do not attempt to take action without suitable protective equipment : Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Avoid contact with skin and eyes. Do not breathe vapours. In case of important spillage : Only qualified personnel equipped with suitable protective equipment may intervene. Mark out the contaminated area with signs and prevent access to unauthorized personnel. Notify police and fire brigade as soon as possible.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Contain the spilled material by bunding. Do not discharge into drains or rivers. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Liquid spill: take up in sand, earth, vermiculite.
Methods for cleaning up : Dispose of contaminated materials in accordance with current regulations.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station. Avoid any direct contact with the product. Do not breathe vapours. Avoid contact of substance with water. Never open the packages under pressure. Access forbidden to unauthorised personnel. Smoking is forbidden.
Hygiene measures : Do not drink, eat or smoke in the workplace. Always wash hands after handling the product. If on skin, take off contaminated clothing.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : The floor of the depot should be impermeable and designed to form a water-tight basin.
Storage conditions : Store in dry, well-ventilated area. Keep container tightly closed. Keep away from food, drink and animal feeding stuffs.
Incompatible materials : Water. Alkali metals. Strong oxidizing agents. Alcohols. fluorinated compounds.
Special rules on packaging : Store always product in container of same material as original container.
Packaging materials : Packing material to avoid : Polyethylene. Polypropylene.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Vanadium trichloride oxide (7727-18-6)	
PNEC (Water)	
PNEC aqua (freshwater)	0.008 mg/l
PNEC aqua (marine water)	0.0008 mg/l
PNEC aqua (intermittent, freshwater)	0.0196 mg/l
PNEC (Sediment)	
PNEC sediment (freshwater)	7.5 mg/kg dwt
PNEC sediment (marine water)	0.75 mg/kg dwt
PNEC (Soil)	
PNEC soil	0.032 mg/kg dwt
PNEC (Oral)	

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Vanadium trichloride oxide (7727-18-6)	
PNEC oral (secondary poisoning)	Bioaccumulation unlikely
PNEC (STP)	
PNEC sewage treatment plant	1.4 mg/l
titanium tetrachloride (7550-45-0)	
DNEL/DMEL (Workers)	
Acute - systemic effects, inhalation	0.618 mg/m ³

8.2. Exposure controls

Appropriate engineering controls:

Ensure good ventilation of the work station. Extraction to remove vapours at their source. Safety shower. Eye fountain.

Personal protective equipment:

Safety glasses. Gloves. Protective clothing. Gas mask.

Hand protection:

Chemical resistant gloves (according to European standard NF EN 374 or equivalent). Breakthrough time : refer to the recommendations of the supplier

Eye protection:

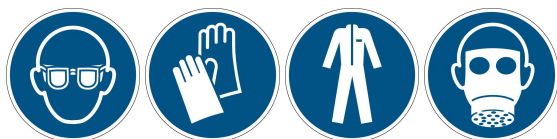
Safety glasses with side shields conformes à a norme NF EN166. In case of increased risk : Face shield

Skin and body protection:

If there is a risk of liquid being splashed : Chemically impervious to liquids protective clothing (type 3) according to standard NF EN14605. If there is a risk of splashes : Chemically protective clothing (type 6) according to standard NF EN13034. Boots

Respiratory protection:

Gas mask with filter type : B2E2P3 (EN 141). Self-contained breathing apparatus



SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Liquid
Colour	: light yellow.
Odour	: chlorine.
Odour threshold	: No data available
pH	: Not applicable
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: No data available
Freezing point	: No data available
Boiling point	: No data available
Flash point	: Not applicable.
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: Not applicable
Vapour pressure	: No data available
Relative vapour density at 20 °C	: No data available
Relative density	: 1.78 (20°C)
Solubility	: No data available
Log Pow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: Not explosive.
Oxidising properties	: Non oxidizing material according to EC criteria.
Explosive limits	: No data available

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9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts violently with water. Contact with water liberates toxic gas.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Reacts violently with water. Exothermic reaction with water.

10.4. Conditions to avoid

Moisture. Air contact.

10.5. Incompatible materials

Water. Alkali metals. Strong oxidizing agents. Alcohols. fluorinated compounds.

10.6. Hazardous decomposition products

Contact with metals produces hydrogen gas which may form explosive mixtures with air. On contact with water : Hydrochloric acid.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:vapour: Fatal if inhaled.

ATE CLP (vapours)	0.920 mg/l/4h
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titanium tetrachloride (7550-45-0)	
LC50 inhalation rat	0.46 mg/l/4h
LC50 inhalation rat (Vapours - mg/l/4h)	0.46 mg/l/4h

Skin corrosion/irritation : Causes severe skin burns and eye damage.

pH: Not applicable

Serious eye damage/irritation : Serious eye damage/eye irritation, Category 1

pH: Not applicable

Respiratory or skin sensitisation : Not classified (Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Not classified (Based on available data, the classification criteria are not met)

Carcinogenicity : Not classified (Based on available data, the classification criteria are not met)

Reproductive toxicity : Not classified (Based on available data, the classification criteria are not met)

Specific target organ toxicity (single exposure) : Causes damage to organs (lungs) (if inhaled).

Specific target organ toxicity (repeated exposure) : Causes damage to organs (lungs) through prolonged or repeated exposure (if inhaled).

Aspiration hazard : Not classified (Based on available data, the classification criteria are not met)

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Toxic to aquatic life with long lasting effects.

Vanadium trichloride oxide (7727-18-6)	
LC50 fish	4 mg/l/96h (Danio rerio) (EU C1)(Published data)
EC50 Daphnia	3.5 mg/l/48h (Daphnia magna) (EU C2) (Published data)
ErC50 (algae)	9.5 mg/l/72h (Pseudokirchnerella subcapitata) (OECD 201)
NOEC chronic fish	0.17 mg/l/ 28 d (Jordanella floridae) (Published data)
NOEC chronic crustacea	0.56 mg/l (Daphnia magna, 14 weeks) (Published data)

titanium tetrachloride (7550-45-0)	
ErC50 (algae)	8.5 mg/l/72h (Scenedesmus subspicatus)

12.2. Persistence and degradability

Vanadium trichloride oxide (7727-18-6)	
Persistence and degradability	Hydrolysis : Instantaneous decomposition in the presence of moisture in the air.
Biodegradation	Not applicable (inorganic substance)

12.3. Bioaccumulative potential

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Vanadium trichloride oxide (7727-18-6)	
BCF	13 (28 days, OECD 305) (Published data)
Log Pow	Not applicable (inorganic substance)
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

Vanadium trichloride oxide (7727-18-6)	
Ecology - soil	The product is not mobile in soil.

12.5. Results of PBT and vPvB assessment

Component	
Vanadium trichloride oxide (7727-18-6)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII
titanium tetrachloride (7550-45-0)	This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Dispose of in accordance with relevant local regulations. Destroy at an authorised site.
Additional information : Empty the packaging completely prior to disposal. The user's attention is drawn to the possible existence of specific european, national or local regulations regarding disposal.

SECTION 14: Transport information

In accordance with ADR / IATA / IMDG / RID / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
3390	3390	3390	3390	3390
14.2. UN proper shipping name				
TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. (titanium tetrachloride(7550-45-0) ; Vanadium trichloride oxide(7727-18-6))	TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. (titanium tetrachloride(7550-45-0) ; Vanadium trichloride oxide(7727-18-6))	Toxic by inhalation liquid, corrosive, n.o.s. (titanium tetrachloride(7550-45-0) ; Vanadium trichloride oxide(7727-18-6))	TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. (titanium tetrachloride(7550-45-0) ; Vanadium trichloride oxide(7727-18-6))	TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S. (titanium tetrachloride(7550-45-0) ; Vanadium trichloride oxide(7727-18-6))
14.3. Transport hazard class(es)				
6.1 (8)	6.1 (8)	6.1 (8)	6.1 (8)	6.1 (8)
14.4. Packing group				
I	I	Not applicable	I	I
14.5. Environmental hazards				
Dangerous for the environment : Yes	Dangerous for the environment : Yes Marine pollutant : Yes	Dangerous for the environment : Yes	Dangerous for the environment : Yes	Dangerous for the environment : Yes

14.6. Special precautions for user

- Overland transport

Classification code (ADR) : TC3
Special provisions (ADR) : 274
Limited quantities (ADR) : 0
Excepted quantities (ADR) : E0
Packing instructions (ADR) : P602
Mixed packing provisions (ADR) : MP8, MP17

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Portable tank and bulk container instructions (ADR)	: T20
Portable tank and bulk container special provisions (ADR)	: TP2
Tank code (ADR)	: L10CH
Tank special provisions (ADR)	: TU14, TU15, TE19, TE21
Vehicle for tank carriage	: AT
Transport category (ADR)	: 1
Special provisions for carriage - Loading, unloading and handling (ADR)	: CV1, CV13, CV28
Special provisions for carriage - Operation (ADR)	: S9, S14
Hazard identification number (Kemler No.)	: 668
Orange plates	:



Tunnel restriction code (ADR)	: C/D
EAC code	: 2XE
APP code	: B

- Transport by sea

Special provisions (IMDG)	: 274
Limited quantities (IMDG)	: 0
Excepted quantities (IMDG)	: E0
Packing instructions (IMDG)	: P602
Tank instructions (IMDG)	: T20
Tank special provisions (IMDG)	: TP2, TP13
EmS-No. (Fire)	: F-A
EmS-No. (Spillage)	: S-B
Stowage category (IMDG)	: D
Properties and observations (IMDG)	: A variety of toxic liquids which present a highly toxic inhalation hazard as well as being corrosive. Highly toxic if swallowed, by skin contact or by inhalation.
MFAG-No	: 154

- Air transport

PCA Limited quantities (IATA)	: Forbidden
PCA limited quantity max net quantity (IATA)	: Forbidden
PCA packing instructions (IATA)	: Forbidden
PCA max net quantity (IATA)	: Forbidden
CAO packing instructions (IATA)	: Forbidden
CAO max net quantity (IATA)	: Forbidden
ERG code (IATA)	: 6C

- Inland waterway transport

Classification code (ADN)	: TC3
Special provisions (ADN)	: 274, 82
Limited quantities (ADN)	: 0
Excepted quantities (ADN)	: E0
Equipment required (ADN)	: PP, EP, TOX, A
Ventilation (ADN)	: VE02
Number of blue cones/lights (ADN)	: 2

- Rail transport

Classification code (RID)	: TC3
Special provisions (RID)	: 274
Limited quantities (RID)	: 0
Excepted quantities (RID)	: E0
Packing instructions (RID)	: P602
Mixed packing provisions (RID)	: MP8, MP17

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Portable tank and bulk container instructions (RID)	: T20
Portable tank and bulk container special provisions (RID)	: TP2
Tank codes for RID tanks (RID)	: L10CH
Special provisions for RID tanks (RID)	: TU14, TU15, TU38, TE21, TE22
Transport category (RID)	: 1
Special provisions for carriage - Loading, unloading and handling (RID)	: CW13, CW28, CW31
Hazard identification number (RID)	: 668

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

15.1.2. National regulations

France :
Specific medical surveillance

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes:

This sheet was updated (refer to the date at the top of this page). Revision : 1.

Abbreviations and acronyms:

IATA	International Air Transport Association
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
IMDG	International Maritime Dangerous Goods
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail

Other information : No experimental study on the product is available. The information given is based on our knowledge of the components and the classification of the product is determined by calculation.
Safety data sheet established by : LISAM SERVICES - TELEGIS
17 rue de la Couture F-60400 Passel
www.lisam-telegis.fr.

Full text of H- and EUH-statements:

Acute Tox. 2 (Inhalation:vapour)	Acute toxicity (inhalation:vapour) Category 2
Aquatic Chronic 2	Hazardous to the aquatic environment — Chronic Hazard, Category 2
Skin Corr. 1B	Skin corrosion/irritation, Category 1B
Skin Corr. 1C	Skin corrosion/irritation, Category 1C
STOT RE 1	Specific target organ toxicity — Repeated exposure, Category 1
STOT SE 1	Specific target organ toxicity — single exposure, Category 1
H314	Causes severe skin burns and eye damage
H330	Fatal 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
EUH014	Reacts violently with water
EUH029	Contact with water liberates toxic gas
EUH071	Corrosive to the respiratory tract

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]:

Acute Tox. 2 (Inhalation:vapour)	H330	Calculation method
Skin Corr. 1B	H314	Calculation method

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STOT SE 1	H370	Calculation method
STOT RE 1	H372	Calculation method
Aquatic Chronic 2	H411	Calculation method

SDS EU (REACH Annex II)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product