

MATERIAL SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING		
PRODUCT IDENTIFIER		
Name of the substance:	Divanadium pentaoxide fused	
Trade name of the substance:	DIVANADIUM PENTAOXIDE	
Identification number:	023-001-00-8	
Registration number:	01-2119531331-54-0003	
EC / List number:	215-239-8	
CAS number:	1314-62-1	
Synonyms:	Divanadium pentoxide granular, divanadium pentoxide flakes	
Relevant identified uses of the substance or mixture and uses advised against		
Identified Uses:	Additive to steel and alloys Manufacture of divanadium pentaoxide	
Uses advised against:	-	
Details of the supplier of the safety data sheet		
Company name:	VANÁDIO DE MARACÁS S/A	
Address:	Fazenda São Conrado, km 18 da estrada municipal que liga o Povoado de Pé de Serra ao Povoado de Porto Alegre, zona rural do município de Maracás – Bahia, CEP 45.360-000; CNPJ/MF:15.191786/0002-20	
Telephone number:	+55 (73) 30470500	
Contact Person:	Mr. Alcides Palma	
E-mail:	alcides.palma@largoresources.com	
Emergency phone:	+55 (71) 997257931	
2. HAZARDS IDENTIFICATION		
CLASSIFICATION OF THE SUBSTANCE OR MIXTURE		
Classification according to Directive 67/548/ECC or 1999/45/EC as amended		
Classification:	Muta. Cat. 3;R68. Repr. Cat 3;R63, T;R48/23, Xn;R20/22, Xi;R37-41, N;R51/53 The full text for all R-phrases is displayed in section 16.	
CLASSIFICATION ACCORDING TO REGULATION (EC) NO 1272/2008 AS AMENDED		
Health hazards		
Acute toxicity, oral:	Category 4	Harmful if swallowed.
Acute toxicity, inhalation:	Category 4	Harmful if inhaled.
Serious eye damage/eye irritation:	Category 1	Causes serious eye damage.
Germ cell mutagenicity:	Category 2	Suspected of causing genetic defects.
Reproductive toxicity:	Category 2	Suspected of damaging the unborn child.
Specific target organ toxicity single exposure:	Category 3	Respiratory Tract Irritation - May cause respiratory irritation.
Specific target organ toxicity repeated exposure:	Category 1	Blood - Causes serious damage to health by prolonged exposure through inhalation

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Environmental Hazards	
Hazardous to the aquatic environment - long term hazard:	Category 2 Toxic to aquatic life with long lasting effects.
HAZARD SUMMARY	
Physical hazards:	Not classified for physical hazards.
Health hazards :	Harmful by inhalation and if swallowed. Irritating to respiratory system. Risk of serious damage to eyes. Toxic: danger of serious damage to health by prolonged exposure through inhalation. Possible risk of harm to the unborn child. Possible risk of irreversible effects. Occupational exposure to the substance or mixture may cause adverse health effects.
Environmental hazards:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Specific hazards:	Vanadium pentoxide may have effects on the respiratory tract, resulting in chronic rhinitis and chronic bronchitis. The substance may cause greenish-black discoloration of the tongue. This substance is possibly carcinogenic to humans. Dusts may irritate the respiratory tract, skin and eyes.
Main symptoms:	Irritation of nose and throat. Irritation of eyes and mucous membranes.
LABEL ELEMENTS	
Label according to Regulation (EC) No. 1272/2008 as amended	
Contains:	Divanadium pentoxide.
Identification No:	023-001-00-8.
Signal word:	Danger.
Hazard statements:	Suspected of causing genetic defects. Suspected of damaging the unborn child. Causes damage to organs (Blood) through prolonged or repeated exposure. Harmful if inhaled. Harmful if swallowed. Causes serious eye damage. May cause respiratory irritation. Toxic to aquatic life with long lasting effects.
Precautionary Statements	
Prevention:	Do not breathe dust/fume/gas/mist/vapors/spray. Wear protective gloves/clothing and eye/face protection. Avoid release to the environment.
Response:	IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTRE or doctor/physician if you feel unwell. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Storage:	Store locked up.
Disposal:	Dispose of contents/container in accordance with local/regional/national/international regulations.

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Supplemental label information:	None.				
Other hazards:	Not a PBT or vPvB substance or mixture.				
3. COMPOSITION/INFORMATION ON INGREDIENTS					
SUBSTANCE					
General information					
Chemical name	%	CAS-No. /EC No	REACH Reg. No.	INDEX No.	INDEX No.
Divanadium pentoxide	≥95≤100	1314-62-1 215-239-8	01- 2119531331- 54-0003	023-001-00-8	#
Classification:	DSD: Muta. cat. 3;R68, Repr. Cat. 3;R63, T;R48/23, Xn;R20/22, Xi:R37-41, N;R51/53 CLP: Acute Tox. 4;H302, Eye Dam. 1;H318, Acute Tox. 4;H332, STOT SE 3;H335, Muta. 2;H341, Repr. 2;H361d, STOT RE 1;H372, Aquatic Chronic 2;H411 #: <i>This substance has workplace exposure limit(s).</i>				
Composition comments:	This product is registered under the REACH Regulation 1907/2006 as a mono-constituent substance. The full text for all R- and H-phrases is displayed in section 16. All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume. For more detailed chemical composition, refer to the certificate of analysis.				
4. FIRST AID MEASURES					
General information:	First aid personnel must be aware of own risk during rescue.				
Description of first aid measures					
Inhalation:	Move to fresh air. Get medical attention if any discomfort continues.				
Skin contact:	Wash with soap and water. Get medical attention if irritation develops or persists.				
Eye contact:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes Remove contact lenses, if present and easy to do. Get medical attention immediately.				
Ingestion:	Immediately rinse mouth and drink plenty of water. Seek immediate medical attention. Do not induce vomiting.				
Most important symptoms and effects, both accurate and delayed:	Irritation of eyes and mucous membranes. Irritation of nose and throat.				
Indication of any immediate Medical attention and special treatment needed:	Treat symptomatically. The effects might be delayed.				

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5. FIREFIGHTING MEASURES	
General fire hazards:	The product is not flammable.
Extinguishing media	
Suitable extinguishing media:	Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media:	None known.
Special hazards arising from the substance or mixture:	Fire may produce irritating, corrosive and/or toxic gases. Avoid creating dust.
Advice for firefighters	
Special protective equipment for firefighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Special firefighting procedures:	Move containers from fire area if you can do it without risk.
6. ACCIDENTAL RELEASE MEASURES	
Personal precautions, protective equipment and emergency procedures	
For non-emergency personnel:	Avoid inhalation of dust and contact with skin and eyes. Provide adequate ventilation. Wear protective clothing as described in section 8 of this safety data sheet.
For emergency responders:	Use personal protection as recommended in section 8 of this SDS.
Environmental precautions: Methods and materials for containment and cleaning up:	Avoid release to the environment. Do not contaminate water. Collect spillage. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into closed container. Vacuums used for this purpose should be equipped with HEPA filters
Reference to other sections:	For personal protection, see section 8. For waste disposal, see section 13.
7. HANDLING AND STORAGE	
Precautions for safe handling:	Avoid dust formation. Avoid inhalation of dust and contact with skin and eyes. Wear appropriate personal protective equipment. Keep the workplace clean. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities:	Keep dry. Store away from incompatible materials. Keep away from food, drink and animal feeding stuffs.
Specific end use(s):	For detailed information, see section 15. Recommendations given in the exposure scenario for the uses are distributed and annexed as separate documents to this SDS.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION				
CONTROL PARAMETERS				
Occupational exposure limits				
UK. EH40 Workplace Exposure Limits (WELs)				
COMPONENTS	TYPE		VALUE	
Divanadium pentaoxide (1314-62-1)	TWA		0.05 mg/m ³	
Recommended monitoring procedures				
DNEL				
MATERIAL	TYPE	ROUTE	VALUE	FORM
Divanadium pentaoxide (1314-62-1)	General Population	Oral	0.14 mg/kg/day	Long term systemic effects
		Inhalation	0.14 mg/m ³	Long term systemic effects
		Inhalation	0.09 mg/m ³	Long term local effects
	Workers	Inhalation	0.5 mg/m ³	Long term systemic effects
		Inhalation	0.14 mg/m ³	Long term local effects
Recommended monitoring procedures: Follow standard monitoring procedures				
PNEC				
MATERIAL	TYPE	ROUTE	VALUE (BASED ON V)	FORM
Divanadium pentaoxide (1314-62-1)	Aqua (freshwater)	Not applicable	7.6 µg/l	
	Aqua (intermittent releases)	Not applicable	6.93 µg/l	
	Aqua (marine water)	Not applicable	2.5 µg/l	
	Oral	Not applicable	0.167 mg/kg	
	Sediment (marine water)	Not applicable	79 mg/kg	
	Sewage Treatment Plant	Not applicable	450 µg/l	
	Soil	Not applicable	7.2 mg/kg d.w.	

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EXPOSURE CONTROLS	
Appropriate engineering Controls:	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Individual protection measures, such as personal protective equipment	
General Information:	Use personal protective equipment as required. Personal protective equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.
Eye/face protection:	Wear dust-resistant safety goggles where there is danger of eye contact.
<i>Skin protection</i>	
- Hand protection	Wear suitable gloves. Suitable gloves can be recommended by the glove supplier.
- Other	Wear suitable protective clothing.
Respiratory protection:	Use respiratory equipment with particle filter, type P3. In case of respirable dust and/or fumes, use self-contained breathing apparatus. Seek advice from local supervisor.
Thermal hazards:	Wear appropriate thermal protective clothing, when necessary.
Hygiene Measures:	When using, do not eat, drink or smoke. Wash hands after handling. Launder contaminated clothing before use. Private clothes and working clothes should be kept separately. Handle in accordance with good industrial hygiene and safety practices. Follow up on any medical surveillance requirements.
Environmental exposure controls:	Contain spills and prevent releases and observe national regulations on emissions.
9. PHYSICAL AND CHEMICAL PROPERTIES	
Information on basic physical and chemical properties	
Appearance:	Crystalline.
Physical state:	Avoid release to the environment. Do not contaminate water.
Form:	Granular. Flakes.
Color:	Yellow to rust brown.
Odor:	Characteristic.
Odor threshold:	N/A
pH:	2.7 (1g/l; 20°C).
Melting point/freezing point:	681°C (1257.8 °F) (1013hPa)
Boiling point, initial boiling point, and boiling range:	1750°C (3182°F) Decomposes.
Flash point:	N/A
Auto-ignition temperature:	N/A
Flammability (solid, gas):	Not flammable

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Flammability limit – lower (%):	N/A
Flammability limit – upper (%):	N/A
Oxidizing properties:	Not oxidizing.
Explosive properties:	Not explosive.
Explosive limit:	N/A
Vapor pressure:	N/A
Vapor density:	N/A
Evaporation rate:	N/A
Relative density:	3.65.
Relative density temperature:	20°C (68°F).
Solubility (water):	0.9-0.94 g/l (20°C/68°F).
Partition coefficient (n-octanol/water):	N/A
Decomposition temperature:	When heated to decomp, emits acrid smoke and irritating fumes of vanadium oxides.
Bulk density:	N/A
Pour point:	N/A
Viscosity	N/A
VOC (Weight%)	N/A
Percent volatile	N/A
Other data:	
Granulometry:	0.5-206 µm Powder. 135-501 µm Granules.
Other information:	No relevant additional information available.

11. TOXICOLOGICAL INFORMATION

General information:	Occupational exposure to the substance or mixture may cause adverse effects.
<i>Information on likely routes of exposure</i>	
- Ingestion:	Harmful if swallowed. Ingestion may cause irritation and malaise.
- Inhalation:	Harmful if inhaled. May cause respiratory irritation.
- Skin contact:	Not irritating (based on in vitro skin irritation test – OECD 439).
- Eye contact:	Causes serious eye damage.
Symptoms:	When heated to decomposition acrid smoke and irritating fumes Irritation of eyes and mucous membranes. Irritation of nose and throat.
<i>Information on toxicological effects</i>	
Acute toxicity:	Harmful if inhaled or swallowed. Ingestion may cause irritation and malaise.

PRODUCT	TEST RESULTS
Divanadium pentaoxide (1314-62-1)	Acute Dermal LD50 Rat: >2,500 mg/kg (Pulverized)
	Acute Inhalation LC50 Rat: >2.21 mg/l 4 Hours (Pulverized)
	Acute Oral LD50 Rat: > 658 mg/kg Pulverized (Technical grade – Fused)

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Skin corrosion/irritation:	Not irritating.
Serious eye damage/eye irritation:	Causes serious eye damage.
Respiratory sensitization:	Not classified.
Skin sensitization:	Not a skin sensitizer.
Germ cell mutagenicity:	Genetic toxicity negative.
Carcinogenicity:	Test data not conclusive.
<i>IARC Monographs. Overall Evaluation of Carcinogenicity</i>	
Divanadium pentaoxide (1314-62-1):	2B Possibly carcinogenic to humans
Reproductive toxicity:	Suspected of damaging the unborn child
Specific target organ toxicity - single exposure:	May cause respiratory irritation
Specific target organ toxicity - repeated exposure:	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
Aspiration hazard:	Not classified.
Mixture versus substance information:	Not relevant.
Other information:	Divanadium pentaoxide may cause greenish-black discoloration of the tongue.
Decomposition temperature:	When heated to decomp, emits acrid smoke and irritating fumes of vanadium oxides.
Bulk density:	N/A
Pour point:	N/A
Viscosity	N/A
VOC (Weight%)	N/A
Percent volatile	N/A
Other data:	
Granulometry:	0.5-206 µm Powder. 135-501 µm Granules.
Other information:	No relevant additional information available.

12. ECOLOGICAL INFORMATION

Toxicity:	Not toxicity data noted for the ingredient(s).
Persistence and degradability:	The product is not biodegradable.
Bio accumulative potential:	BCF: 12.3l/kg wet weight. BSAF: < 0.036.
Mobility:	Soil – Log Kp = 2.79 L/kg; Sediment – Log Kp = 4.89 L/kg; Suspended matter – Log Kp = 4.50 L/kg
Environmental fate-partition coefficient:	Not applicable.
Mobility on soil:	log Kp = 2.79 L/kg.
Results of PBT and vPvB assessment:	Not relevant for an inorganic substance.
Other adverse effects:	No other adverse effect identified.

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13. DISPOSAL CONSIDERATIONS	
WASTE TREATMENT METHODS	
Residual waste:	Dispose of in accordance with local regulations.
Contaminated packaging:	Since emptied containers may retain product residue, follow label warning even after container is emptied.
EU waste code:	06 13 16
Disposal methods/information:	Dispose in accordance with all applicable regulations.
14. TRANSPORT INFORMATION	
Shipping name:	Vanadium compounds, N.O.S.
Shipping description:	UN3285, Vanadium compounds, N.O.S., 6.1, III.
ADR:	The product is not covered by international regulation on the transport of dangerous goods.
RID:	The product is not covered by international regulation on the transport of dangerous goods.
ADN:	The product is not covered by international regulation on the transport of dangerous goods.
IATA:	The product is not covered by international regulation on the transport of dangerous goods.
IMDG:	The product is not covered by international regulation on the transport of dangerous goods.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:	Not applicable. However, this product is a solid. When transported in bulk, it is not covered under Appendix I of the IMSBC Code.
15. REGULATORY INFORMATION	
SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE SUBSTANCE OR MIXTURE	
EU Regulations	
Regulation (EC) No. 2037/2000 on substance that deplete the ozone layer,	Not listed
Regulation (EC) No. 2037/2000 on substance that deplete the ozone layer,	Not listed
Regulation (EC) No. 850/2004 on persistent organic pollutants, Annex I:	
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 1:	Not listed
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 2:	Not listed
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 3:	Not listed

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Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex V:	Not listed
Directive 96/61/EC concerning integrated pollution prevention and control (IPPC): Article 15, European Pollution Emission Registry (EPER):	Not listed
Regulation (EC) No. 1907/2006 REACH article 59(1). Candidate list:	Not listed
Other Regulations:	The product is classified and labelled in accordance with EC directives or respective national laws. This Safety Data Sheet complies with the requirements of Regulation (EC) No. 1907/2006. 96/82/EC (Seveso II) Directive; Part 2 (Classified Substances) – Dangerous for the Environment (ii).
National Regulations:	Pregnant women should not work with the product, if there is the least risk of exposure. Young people under 18 years old are not allowed to work with this product according to EU Directive 94/33/EC on the protection of young people at work. Follow national regulation for work with chemical agents.
Chemical safety assessment:	For this substance a chemical safety assessment has been carried out.
	Exposures scenarios available for: Uses by workers in industrial settings. Manufacture of divanadium pentaoxide. Manufacture of divanadium pentaoxide in the catalyst industry. Industrial use of vanadium pentaoxide-containing catalysts. Industrial use of divanadium pentaoxide in the production of steel and alloys. Industrial use of divanadium pentaoxide in battery electrolytes. Industrial use of divanadium pentaoxide in petrochemical sector. Industrial use of divanadium pentaoxide in batteries. Use of divanadium pentaoxide in solutions in laboratories. Industrial use of divanadium pentaoxide in the manufacture of other vanadium compounds.
	Industrial use of divanadium pentaoxide in the production of pigments, frits, enamels and glass.
	Uses by professional workers: Professional use of divanadium pentaoxide solutions in laboratories and divanadium pentaoxide (DENOX) catalysts.
	Uses by consumers: None.

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16. OTHER INFORMATION

List of abbreviations:

DNEL: Derived No-Effect Level.
PNEC: Predicted No-Effect Concentration.
PBT: Persistent, bio accumulative and toxic.
vPvB: Very Persistent and very Bio accumulative.
DSD: Directive 67/548/EEC.
CLP: Regulation No. 1272/2008.
LD50: Lethal Dose, 50%.
LC50: Lethal Concentration, 50%.
BCF: Bio Concentration Factor.
BSAF: Biota-to-soil-accumulation factor.

References:

IUCLID
Chemical safety report
IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1-100A)

Information on evaluation method leading to the classification of mixture:

The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available.

Full text of any statements or R-phrases and H-phrases under sections 2 to 15:

R20/22 Harmful by inhalation and if swallowed.
R37 Irritating to respiratory system.
R41 Risk of serious damage to eyes.
R48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R63 Possible risk of harm to the unborn child.
R68 Possible risk of irreversible effects.
H302 – Harmful if swallowed.
H318 – Causes serious eye damage.
H332 – Harmful if inhaled.
H335 – May cause respiratory irritation.
H341 – Suspected of causing genetic defects.
H361d – Suspected of damaging the unborn child.
H372 – Causes damage to organs through prolonged or repeated exposure.

Training Information Disclaimer:

H411 – Toxic to aquatic life with long lasting effects.
Follow training instructions when handling this material.
This Safety Data Sheet is specifically designed to comply with the requirements of the EU Regulation called REACH- Registration, Evaluation and Authorisation of Chemicals (EC No. 1907/2006 of the European Parliament and of the Council of 18 December 2006) and the corresponding country law and may not comply with the requirements of any other regulations for safe product handling.