

## SAFETY DATA SHEET

ACCORDING TO EC-REGULATIONS 1907/2006 (REACH) & 1272/2008 (CLP)

### SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

#### 1.1 Product identifier

Chemical Name	Ferrovandium
Trade name	Ferrovandium
CAS No.	12604-58-9
EINECS No.	Ferrovandium is an alloy containing iron (EC No. 231-096-4) and vanadium (EC No. 231-171-1)
REACH Registration No.	01-2119537418-34-0012 (Vanadium)

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

Identified use(s)	Industrial use in the steel and other alloys industries (including light metal alloys, hydrogen storage alloys, master alloys, super alloys & welding electrodes. Industrial use of ferrovandium in the titanium industry
Uses advised against	None.

#### 1.3 Details of the supplier of the safety data sheet

Company Identification	Stanford Advanced Materials E-mail : sales@samaterials.com Tel : (949) 407-8904 Address : 23661 Birtcher Dr., Lake Forest, CA 92630 U.S.A.
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#### 1.4

## SECTION 2: HAZARDS IDENTIFICATION

<b>2.1</b>	<b>Classification of the substance or mixture</b>	
<b>2.1.1</b>	<b>Regulation (EC) No. 1272/2008 (CLP)</b>	Not classified
<b>2.1.2</b>	<b>Directive 67/548/EEC &amp; Directive 1999/45/EC</b>	Not classified
<b>2.2</b>	<b>Label elements</b>	
<b>2.2.1</b>	<b>Label elements</b>	According to Regulation (EC) No. 1272/2008 (CLP)
	Hazard pictogram(s)	Not classified
	Signal word(s)	Not classified
	Hazard statement(s)	Not classified
	Precautionary statement(s)	Not classified
<b>2.2.2</b>	<b>Label elements</b>	According to Directive 67/548/EEC & Directive 1999/45/EC
	Hazard Symbol	Not classified
	Risk Phrases	Not classified
	Safety Phrases	Not classified
<b>2.3</b>	<b>Other hazards</b>	<p>Eye Contact: Dust may cause irritation. Chips may cause corneal injury.</p> <p>Skin Contact: Repeated and/or prolonged contact may cause dermatitis.</p> <p>Inhalation: Dust may cause irritation. (Coughing/Sneezing.)</p> <p>Danger of dust explosion in fine dusty form or when ground to a small particle size. Lumps may have razor-sharp edges.</p>
<b>2.4</b>	<b>Additional Information</b>	None

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Ferrovandium is an alloy containing iron, vanadium and other trace metals. None of the ingredients is present in unalloyed form.

EC Classification No. 1272/2008

Component	%W/W	CAS No.	REACH Registration No.	Hazard statement(s)
Ferrovandium	100	12604-58-9	01-2119537418-34-0012 (Vanadium)	Not classified.

EC Classification No. 67/548/EEC

Component	%W/W	CAS No.	REACH Registration No.	EC Classification and Risk Phrases
Ferrovandium	100	12604-58-9	01-2119537418-34-0012 (Vanadium)	Not classified.

### 3.2 Mixtures

Ferrovandium is a special preparation (alloy)

### 3.3 Additional Information

For full text of H/P phrases see section 16.

## SECTION 4: FIRST AID MEASURES



### 4.1 Description of first aid measures

Inhalation	Remove from exposure. Keep patient at rest and give oxygen if breathing difficult. If symptoms develop, obtain medical attention.
Skin Contact	After contact with skin, wash immediately with plenty of soap and water.
Eye Contact	Remove particles by irrigating with eye wash solution or clean water, holding the eyelids apart. If symptoms develop, obtain medical attention.
Ingestion	Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Do not induce vomiting. If symptoms develop, obtain medical attention.

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

Eye Contact: Dust may cause irritation. Chips may cause corneal injury.

Skin Contact: Repeated and/or prolonged contact may cause dermatitis.

Inhalation: Dust may cause irritation. (Coughing/Sneezing.)

### 4.3 Indication of the immediate medical attention and special treatment needed

See Section: 4.1

## SECTION 5: FIRE-FIGHTING MEASURES

### 5.1 Extinguishing media

Suitable Extinguishing Media	Class D fire. Extinguish preferably with dry chemical, sand or carbon dioxide.
Unsuitable Extinguishing Media	Do not use water jet or waterspray. Contact with water liberates extremely flammable gases.

### 5.2 Special hazards arising from the substance or mixture

No information available.

### 5.3 Advice for fire-fighters

A self contained breathing apparatus and suitable protective clothing should be worn in fire conditions. Avoid generation of dust. Danger of dust explosion. Avoid release to the environment. Do not allow to enter drains, sewers or

watercourses.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

- |            |                                                                            |                                                                                                                                                                                                                                                                                                       |
|------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>6.1</b> | <b>Personal precautions, protective equipment and emergency procedures</b> | Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Section: 8. Dust clouds are sensitive to ignition by electrostatic discharge. Eliminate sources of ignition.                                                                                  |
| <b>6.2</b> | <b>Environmental precautions</b>                                           | Avoid release to the environment. Do not allow to enter drains, sewers or watercourses.                                                                                                                                                                                                               |
| <b>6.3</b> | <b>Methods and material for containment and cleaning up</b>                | Use vacuum equipment for collecting spilt materials, where practicable. Sweep up spilled substance but avoid making dust. Dampening with water can reduce dust. Transfer to a lidded container for disposal or recovery. Dispose of contents in accordance with local, state or national legislation. |
| <b>6.4</b> | <b>Reference to other sections</b>                                         | See Section: 13.                                                                                                                                                                                                                                                                                      |
| <b>6.5</b> | <b>Additional Information</b>                                              | None                                                                                                                                                                                                                                                                                                  |

## SECTION 7: HANDLING AND STORAGE




- |            |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7.1</b> | <b>Precautions for safe handling</b>                                | Avoid dust generation. Avoid inhalation of dusts. Danger of dust explosion in fine dusty form or when ground to a small particle size. Dust clouds are sensitive to ignition by electrostatic discharge. Ensure adequate earthing. Where suitable engineering controls are not fitted or are inadequate, wear suitable protective equipment. Do not eat, drink or smoke at the work place. Wear protective equipment to comply with good occupational hygiene practice. See Section: 8. |
| <b>7.2</b> | <b>Conditions for safe storage, including any incompatibilities</b> | Keep only in the original container. Keep container tightly closed. Keep in a cool, well-ventilated place away from:<br>Oxidizing agents.                                                                                                                                                                                                                                                                                                                                               |
|            | Storage Temperature                                                 | Ambient.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|            | Storage Life                                                        | Stable under normal conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | Incompatible materials                                              | Combustible materials                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>7.3</b> | <b>Specific end use(s)</b>                                          | See Annex I                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1** Control parameters
- 8.1.1** Occupational Exposure Limits

SUBSTANCE.	CAS No.	LOEL (8 hr TWA ppm)	LOEL (8 hr TWA mg/m <sup>3</sup> )	STEL (ppm)	STEL (mg/m <sup>3</sup> )	Note:

Ferrovandium	12604-58-9		10			Total Dust.
			5			Respirable Dust.

<b>8.1.2</b>	<b>Biological limit value</b>	No information available.
<b>8.1.3</b>	<b>PNECs and DNELs</b>	No information available.
<b>8.2</b>	<b>Exposure controls</b>	
<b>8.2.1</b>	<b>Appropriate engineering controls</b>	Provide adequate ventilation when using the material and follow the principles of good occupational hygiene to control personal exposures. Ensure adequate ventilation. Local exhaust ventilation is required. Avoid dust generation.
<b>8.2.2</b>	<b>Personal protection equipment</b>	
	Eye/face protection	Wear suitable eye/face protection. (EN 166).
		
	Skin protection (Hand protection/ Other)	Use skin barrier cream before handling the product. Wear suitable gloves if prolonged skin contact is likely. Lumps may have razor-sharp edges. Contaminated clothing should be thoroughly cleaned.
		
	Respiratory protection	No special requirements. Provide adequate ventilation, including appropriate local extraction if dusts, fumes or vapours are likely to be evolved. Wear suitable respiratory protective equipment if exposure to high levels of material are likely.
		
	Thermal hazards	No information available.
<b>8.2.3</b>	<b>Environmental Exposure Controls</b>	Avoid release to the environment. Do not allow to enter drains, sewers or watercourses.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<b>9.1</b>	<b>Information on basic physical and chemical properties</b>	
	Appearance	Solid
	Colour	Silver.
	Odour	Odourless.
	Odour Threshold (ppm)	Not applicable.
	pH (Value)	Not applicable.
	Melting Point (°C)	FeV : 1540 – 1680 °C
	Boiling point/boiling range (°C):	Not applicable.

Flash Point (°C)	Not applicable.
Flammability (solid, gas)	Dust is combustible.
Explosive limit ranges	Danger of dust explosion in fine dusty form or when ground to a small particle size.
Vapour Pressure (Pascal)	Not available.
Vapour Density (Air=1)	No information available.
Specific Gravity	No information available.
Density (g/ml)	ca. 6.5 g/ml
Solubility (Water)	Insoluble in water.
Partition Coefficient (n-Octanol/water)	No information available.
Auto Ignition Temperature (°C)	No information available.
Decomposition Temperature (°C)	Not applicable.
Viscosity (mPa.s)	Not applicable (Solid)
Explosive properties	Danger of dust explosion in fine dusty form or when ground to a small particle size.
Oxidising properties	None
<b>9.2 Other information</b>	No information available.

## SECTION 10: STABILITY AND REACTIVITY

<b>10.1 Reactivity</b>	No information available.
<b>10.2 Chemical stability</b>	Stable under normal conditions.
<b>10.3 Possibility of hazardous reactions</b>	Yes
<b>10.4 Conditions to avoid</b>	Avoid dust generation.
<b>10.5 Incompatible materials</b>	Strong oxidising agents.
<b>10.6 Hazardous Decomposition Product(s)</b>	Will very slowly oxidize to vanadium oxide.

## SECTION 11: TOXICOLOGICAL INFORMATION

<b>11.1 Information on toxicological effects</b>	
<b>11.1.1 Substances</b>	
<b>Acute toxicity</b>	
Ingestion	Not classified.
Inhalation	Not classified. Dust may cause irritation.
Skin Contact	Not classified. Dust may cause irritation.
Eye Contact	Not classified. Dust may have irritant effect on eyes. Lumps may have razor-sharp edges. May cause corneal injury.
<b>Hazard label(s)</b>	None required
<b>Serious eye damage/irritation</b>	None reported
<b>respiratory or skin sensitization</b>	No.
<b>Mutagenicity</b>	No.
<b>Carcinogenicity</b>	No.

Reproductive toxicity	No.
STOT-single exposure	None
STOT-repeated exposure	None
Aspiration hazard	No.
11.2 Other information	None

## SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity	No environmental hazards have been reported or known.
12.2 Persistence and degradability	The product is likely to persist in the environment. Will very slowly oxidize to vanadium oxide.
12.3 Bioaccumulative potential	The product has no potential for bioaccumulation.
12.4 Mobility in soil	No information available.
12.5 Results of PBT and vPvB assessment	Not classified as PBT or vPvB.
12.6 Other adverse effects	None identified

## SECTION 13: DISPOSAL CONSIDERATIONS

This product does not possess characteristics which may qualify it as hazardous waste.

13.1 Waste treatment methods	None identified
13.2 Additional Information	Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Bury on an authorised landfill site or incinerate under approved controlled conditions. Consult an accredited waste disposal contractor or the local authority for advice.

## SECTION 14: TRANSPORT INFORMATION

UN number	Ferrovandium is not subject to the requirements of ADR
Proper Shipping Name	N/A
Transport hazard class(es)	N/A
Packing Group	N/A
Hazard label(s)	N/A
Environmental hazards	N/A
Special precautions for user	N/A

## SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture	
15.1.1 EU regulations	
Authorisations and/or restrictions on use	None

15.1.2	National regulations	None
15.2	Chemical Safety Assessment	Not carried out

## SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: 1-16.

### LEGEND

LTEL	Long Term Exposure Limit
STEL	Short Term Exposure Limit
STOT	Specific Target Organ Toxicity
DNEL	Derived No Effect Level
PNEL	Predicted No Effect Concentration

### References:

No information available.

### Risk Phrases and Safety Phrases

Not classified.

### Hazard statement(s) and Precautionary statement(s)

Not classified.

### Training advice:

None required

### Additional Information:

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## Annex to the extended Safety Data Sheet (eSDS)

## Identified use(s)

Uses by workers in industrial settings			
IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
1	Industrial use in the steel and other alloys industries (including light metal alloys, hydrogen storage alloys, master alloys, super alloys & welding electrodes)	as such (in a mixture)	<p><b>Process category [PROC]</b></p> <p>PROC2 Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 Use in closed batch process (synthesis or formulation)</p> <p>PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises</p> <p>PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC6 Calendering operations</p> <p>PROC8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>PROC13 Treatment of articles by dipping and pouring</p> <p>PROC14 Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>PROC21 Low energy manipulation of substances bound in materials and/or articles</p> <p>PROC22 Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting</p> <p>PROC23 Open processing and transfer operations with minerals/metals at elevated temperature</p> <p>PROC24 High (mechanical) energy work-up of substances bound in materials and/or articles</p> <p>PROC25 Other hot work operations with metals</p> <p>PROC26 Handling of solid inorganic substances at ambient temperature</p> <p>PROC27a Production of metal powders (hot processes)</p> <p>PROC27b Production of metal powders (wet processes)</p> <p><b>Environmental release categories [ERC]:</b></p>

Uses by workers in industrial settings			
IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
			<p>ERC2 Formulation of preparations</p> <p>ERC3 Formulation in materials</p> <p>ERC5 Industrial use resulting in inclusion into or onto a matrix</p> <p>ERC12a Industrial processing of articles with abrasive techniques (low release)</p> <p>ERC12b Industrial processing of articles with abrasive techniques (high release)</p> <p><b>Sectors of use [SU]:</b></p> <p>SU8 Manufacture of bulk, large scale chemicals (including petroleum products)</p> <p>SU9 Manufacture of fine chemicals</p> <p>SU14 Manufacture of basic metals, including alloys</p> <p>SU15 Manufacture of fabricated metal products, except machinery and equipment</p> <p>SU16 Manufacture of computer, electronic and optical products, electrical equipment</p> <p>SU17 General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment</p> <p>SU19 Building and construction work</p> <p>SU23 Electricity, steam, gas, water supply and sewage treatment</p> <p>SU0 Other</p> <p><b>Subsequent service life relevant for that use?:</b> Yes</p> <p><b>Article Categories [AC]:</b></p> <p>AC1 Vehicles</p> <p>AC2 Machinery, mechanical appliances, electrical/electronic articles</p> <p>AC3 Electrical batteries and accumulators</p> <p>AC7 Metal articles</p>

Uses by workers in industrial settings			
IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
2	Industrial use of ferrovanadium in the titanium industry	as such (in a mixture)	<p><b>Process category [PROC]:</b></p> <p>PROC1 Use in closed process, no likelihood of exposure</p> <p>PROC3 Use in closed batch process (synthesis or formulation)</p> <p>PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>PROC13 Treatment of articles by dipping and pouring</p> <p>PROC14 Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>PROC21 Low energy manipulation of substances bound in materials and/or articles</p> <p>PROC22 Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting</p> <p>PROC23 Open processing and transfer operations with minerals/metals at elevated temperature</p> <p>PROC24 High (mechanical) energy work-up of substances bound in materials and/or articles</p> <p>PROC25 Other hot work operations with metals</p> <p>PROC26 Handling of solid inorganic substances at ambient temperature</p> <p>PROC27a Production of metal powders (hot processes)</p> <p>PROC27b Production of metal powders (wet processes)</p> <p><b>Market sector by type of chemical product:</b></p> <p>PC7 Base metals and alloys</p> <p><b>Environmental release categories [ERC]:</b></p> <p>ERC2 Formulation of preparations</p> <p>ERC3 Formulation in materials</p> <p>ERC5 Industrial use resulting in inclusion into or onto a matrix</p> <p>ERC12a Industrial processing of articles with abrasive techniques (low release)</p>

Uses by workers in industrial settings			
IU number	Identified Use (IU) name	Substance supplied to that use	Use descriptors
			<p>ERC12b Industrial processing of articles with abrasive techniques (high release)</p> <p><b>Sectors of use [SU]:</b>            SU14 Manufacture of basic metals, including alloys            SU15 Manufacture of fabricated metal products, except machinery and equipment            SU24 Scientific research and development</p> <p><b>Subsequent service life relevant for that use?:</b> Yes</p> <p><b>Article Categories [AC]:</b>            AC1 Vehicles            AC2 Machinery, mechanical appliances, electrical/electronic articles            AC7 Metal articles</p>