MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name: FERROSILICON
Revision date: 01-26-2012
Version #: 01
CAS #: 8049-17-0
Product use: Metallurgical applications.
Manufacturer/Supplier: ELFUSA GERAL DE ELETROFUSÃO LTDA
JULIO MICHELAZZO, 501 - SÃO JOÃO DA BOA VISTA - SP -BRAZIL
ZIP CODE 13872-900
SPAIN
qualidade@elfusa.com.br
Contact Person: RUBEN SINATO
Telephone: (+5519) 3634-2300
Emergency: 1-866-519-4752
1-760-476-3962
Access Code: 333691

2. Hazards Identification

Physical state: Solid.
Appearance: Gray powder and grains.
Emergency overview: Low hazard under normal conditions.
OSHA regulatory status: This product is not hazardous according to OSHA 29CFR 1910.1200.
Potential health effects
   Routes of exposure: Inhalation. Ingestion. Skin contact. Eye contact.
   Eyes: Dust may irritate the eyes.
   Skin: Dust may irritate skin.
   Inhalation: Dust may irritate the respiratory system.
   Ingestion: Ingestion may cause irritation and malaise.
Target organs: Eyes. Skin. Reproductive system.
Chronic effects: Prolonged and repeated overexposure to dust can lead to pneumoconiosis.
Signs and symptoms: Irritation of eyes and mucous membranes. Irritation of nose and throat.
Potential environmental effects: Ecological injuries are not known or expected under normal use.

Health effects of additional components
Aluminium: Signs and symptoms: Irritation of eyes and mucous membranes.

3. Composition / Information on Ingredients

Components | CAS # | Percent
--- | --- | ---
Ferrosilicon | 8049-17-0 | ≤ 93.0
Impurities: P+Cr+Ca+Zr | N/A | ≤ 1

Constituents

<table>
<thead>
<tr>
<th>Chemical property</th>
<th>CAS #</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>7439-89-6</td>
<td>78</td>
</tr>
<tr>
<td>Aluminium</td>
<td>7429-90-5</td>
<td>2</td>
</tr>
<tr>
<td>Titanium</td>
<td>7440-32-6</td>
<td>2</td>
</tr>
<tr>
<td>Silicon</td>
<td>7440-21-3</td>
<td>15</td>
</tr>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>1</td>
</tr>
</tbody>
</table>
4. First Aid Measures

First aid procedures

Eye contact
Flush eyes thoroughly with water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact
Wash with soap and water. Get medical attention if irritation develops or persists.

Inhalation
Move to fresh air. Get medical attention if any discomfort continues.

Ingestion
Immediately rinse mouth and drink plenty of water. Get medical attention if irritation develops and persists.

Notes to physician
Treat symptomatically.

General advice
Get medical attention if any discomfort develops.

5. Fire Fighting Measures

Flammable properties
The product is not flammable.

Extinguishing media

Suitable extinguishing media
Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media
No restrictions known.

Protection of firefighters

Specific hazards arising from the chemical
None known.

Protective equipment and precautions for firefighters
Self-contained breathing apparatus, operated in positive pressure mode and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions
Move containers from fire area if you can do it without risk.

6. Accidental Release Measures

Personal precautions
Ensure adequate ventilation. Avoid inhalation of dust and contact with skin and eyes. Wear protective clothing as described in Section 8 of this safety data sheet.

Environmental precautions
Avoid release to the environment. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Recover and recycle, if practical. Sweep up or vacuum up spillage and collect in suitable container for disposal. Do not vacuum clean unless vacuum cleaners are equipped with HEPA filter.

7. Handling and Storage

Handling
Provide adequate ventilation. Use work methods which minimize dust production. Avoid inhalation of dust and contact with skin and eyes. Wear appropriate personal protective equipment. Do not add wet alumina to electrolysis cells. Observe good industrial hygiene practices.

Storage
Store in a dry place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Constituents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Manganese (7439-96-5)</td>
<td>TWA</td>
<td>0.2 mg/m³</td>
<td></td>
</tr>
<tr>
<td>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>PEL</td>
<td>5 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Constituents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>PEL</td>
<td>5 mg/m³</td>
<td>Respirable dust.</td>
</tr>
</tbody>
</table>

FERROSILICON CPH MSDS NA
906486  Version #: 01  Revision date: 01-26-2012  Print date: 01-26-2012

Composition comments
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.
### US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese (7439-96-5)</td>
<td>Ceiling</td>
<td>5 mg/m³</td>
<td>Fume.</td>
</tr>
<tr>
<td>Silicon (7440-21-3)</td>
<td>PEL</td>
<td>5 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 mg/m³</td>
<td>Total dust.</td>
</tr>
</tbody>
</table>

### Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Pyrophoric powder.</td>
</tr>
<tr>
<td>Manganese (7439-96-5)</td>
<td>TWA</td>
<td>0.2 mg/m³</td>
<td>Dust.</td>
</tr>
</tbody>
</table>

### Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable.</td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable.</td>
</tr>
<tr>
<td>Manganese (7439-96-5)</td>
<td>TWA</td>
<td>0.2 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

### Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Manganese (7439-96-5)</td>
<td>TWA</td>
<td>0.2 mg/m³</td>
<td>Total dust.</td>
</tr>
<tr>
<td>Silicon (7440-21-3)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

### Canada. Quebec OELS. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td>Total dust.</td>
</tr>
<tr>
<td>Aluminium (7429-90-5)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Welding fume.</td>
</tr>
<tr>
<td>Manganese (7439-96-5)</td>
<td>TWA</td>
<td>3 mg/m³</td>
<td>Fume.</td>
</tr>
<tr>
<td>Silicon (7440-21-3)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

### Mexico. Occupational Exposure Limit Values

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrosilicon (8049-17-0)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

### Exposure guidelines

No exposure standards allocated.

### Engineering controls

Provide sufficient ventilation for operations causing dust formation. If engineering measures are not sufficient to maintain concentrations of dust particulates below the Occupational Exposure Limit (OEL), suitable respiratory protection must be worn.

### Personal protective equipment

#### Eye / face protection

Wear goggles/face shield.

#### Skin protection

Wear suitable gloves. Suitable gloves can be recommended by the glove supplier. Wear suitable protective clothing.

#### Respiratory protection

Seek advice from local supervisor.
General hygiene considerations
Wash hands after handling. Routinely wash work clothing and protective equipment to remove contaminants. Handle in accordance with good industrial hygiene and safety practice. Follow up on any medical surveillance requirements.

9. Physical & Chemical Properties

Appearance  Gray powder and grains.
Color  Gray.
Odor  Odorless.
Odor threshold  Not available.
Physical state  Solid.
Form  Powder and grains.
P H  9
Melting point  2732 °F (1500 °C)
Freezing point  Not available.
Boiling point  Not available.
Flash point  Not available.
Evaporation rate  Not applicable.
Flammability limits in air, upper, % by volume  Not available.
Flammability limits in air, lower, % by volume  Not available.
Vapor pressure  Not applicable.
Vapor density  Not applicable.
Specific gravity  6.91
Solubility (water)  Insoluble
Partition coefficient (n-octanol/water)  Not applicable.
Auto-ignition temperature  Not applicable.
Decomposition temperature  Not available.
Viscosity  Not applicable.
Bulk density  Not applicable.

10. Chemical Stability & Reactivity Information

Chemical stability  Stable at normal conditions.
Conditions to avoid  Moisture. Contact with incompatible materials.
Incompatible materials  None known.
Hazardous decomposition products  No hazardous decomposition products are known.
Possibility of hazardous reactions  Hazardous polymerization does not occur. Hazardous reactions do not occur.

11. Toxicological Information

Toxicological data

Product  Test Results
Ferrosilicon (8049-17-0)  Acute Oral LD50 Rat: > 5000 mg/kg

Acute effects  Dust may cause eye, skin and respiratory tract irritation.
Local effects  May cause irritation through mechanical abrasion.
Sensitization  No sensitizing effects known.
Chronic effects  Prolonged and repeated overexposure to dust can lead to pneumoconiosis.
Carcinogenicity  Test data conclusive but not sufficient for classification.

ACGIH Carcinogens
Aluminium (CAS 7429-90-5)  A4 Not classifiable as a human carcinogen.
Mutagenicity Test data conclusive but not sufficient for classification.
Reproductive effects Test data conclusive but not sufficient for classification.
Symptoms and target organs Irritation of eyes and mucous membranes. Irritation of nose and throat.
Further information Prolonged and repeated overexposure to dust can lead to pneumoconiosis.

12. Ecological Information

Ecotoxicity This product has no known eco-toxicological effects. The product is not expected to be hazardous to the environment.
Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Aquatic toxicity Not expected to be harmful to aquatic organisms.
Persistence and degradability The product is not biodegradable.
Bioaccumulation / Accumulation The product is not bioaccumulating.
Partition coefficient (n-octanol/water) Not applicable.
Mobility in environmental media The product is insoluble in water. Aluminum oxide is not mobile in the environment, unless it comes into contact with an aqueous environment with a pH below 5.5 or above 8.5.

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations.
Waste from residues / unused products Recover and recycle, if practical. Dispose of in accordance with local regulations.
Contaminated packaging Offer rinsed packaging material to local recycling facilities. Dispose of in accordance with local regulations.

14. Transport Information

DOT Not regulated as dangerous goods.
IATA Not regulated as dangerous goods.
IMDG Not regulated as dangerous goods.
TDG Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is not hazardous according to OSHA 29CFR 1910.1200. All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
Not regulated.

US CAA Section 112 Hazardous Air Pollutants (HAPs) List
Manganese (CAS 7439-96-5)

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration
Aluminium (CAS 7429-90-5) 1.0 %
Manganese (CAS 7439-96-5) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance
Aluminium (CAS 7429-90-5) Listed.
Manganese (CAS 7439-96-5) Listed.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)
None
Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
- Immediate Hazard - No
- Delayed Hazard - No
- Fire Hazard - No
- Pressure Hazard - No
- Reactivity Hazard - No

Section 302 extremely hazardous substance (40 CRF 355, Appendix A)
No

Section 311/312 (40 CFR 370)
No

Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)
Not controlled

WHMIS status
Controlled

WHMIS classification
D1B - Immediate/Serious-TOXIC

Inventory status

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>No</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>No</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>No</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>No</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>Yes</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>No</td>
</tr>
</tbody>
</table>

*A “Yes” indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations
This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance
- Aluminium (CAS 7429-90-5) Listed.
- Iron (CAS 7439-89-6) Listed.
- Manganese (CAS 7439-96-5) Listed.
- Titanium (CAS 7440-32-6) Listed.

US - Massachusetts RTK - Substance: Listed substance
- Aluminium (CAS 7429-90-5) Listed.
- Manganese (CAS 7439-96-5) Listed.
- Silicon (CAS 7440-21-3) Listed.

US - New Jersey Community RTK (EHS Survey): Reportable threshold
- Aluminium (CAS 7429-90-5) 500 LBS
- Manganese (CAS 7439-96-5) 500 LBS

US - New Jersey RTK - Substances: Listed substance
- Aluminium (CAS 7429-90-5) Listed.
- Ferrosilicon (CAS 8049-17-0) Listed.
- Manganese (CAS 7439-96-5) Listed.
- Silicon (CAS 7440-21-3) Listed.
- Titanium (CAS 7440-32-6) Listed.
US - Pennsylvania RTK - Hazardous Substances: All compounds of this substance are considered environmental hazards

Manganese (CAS 7439-96-5) LISTED

US - Pennsylvania RTK - Hazardous Substances: Listed substance

Aluminium (CAS 7429-90-5) Listed.
Manganese (CAS 7439-96-5) Listed.
Silicon (CAS 7440-21-3) Listed.

16. Other Information

Recommended restrictions

HMIS® ratings
Health: 1
Flammability: 0
Physical hazard: 0

NFPA ratings
Health: 1
Flammability: 0
Instability: 0

Disclaimer
The information in the sheet was written based on the best knowledge and experience currently available.

Issue date
01-25-2012