1. Product and Company Identification

Material name: MAGNESIUM ALUMINATE SPINELS
Revision date: 01-26-2012
Version #: 01
CAS #: 12068-51-8
Product use: Refractory.
Synonym(s): MAE-10, MAE-26, MAE-28 and MAE-32
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: Beige or white grain and powder.
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.

3. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS #</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium aluminum Oxide</td>
<td>12068-51-8</td>
<td>≥ 80.0</td>
</tr>
<tr>
<td>Impurities: Other Oxides Total</td>
<td>N/A</td>
<td>≤ 1</td>
</tr>
</tbody>
</table>

Constituents

<table>
<thead>
<tr>
<th>Chemical property</th>
<th>CAS #</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium oxide</td>
<td>1309-48-4</td>
<td>8.5 - 33</td>
</tr>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
<td>64.5 - 90.5</td>
</tr>
</tbody>
</table>

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.
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**

- **US. ACGIH Threshold Limit Values**

<table>
<thead>
<tr>
<th>Material</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium aluminum oxide (12068-51-8)</td>
<td>TWA</td>
<td>1 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
</tbody>
</table>

- **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>Aluminum oxide (1344-28-1)</td>
<td>PEL</td>
<td>5 mg/m³</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Magnesium oxide (1309-48-4)</td>
<td>PEL</td>
<td>15 mg/m³</td>
<td>Total particulate.</td>
</tr>
<tr>
<td>Magnesium oxide (1309-48-4)</td>
<td>PEL</td>
<td>15 mg/m³</td>
<td>Total particulate.</td>
</tr>
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</tr>
<tr>
<td>----------</td>
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<td>--------------</td>
</tr>
<tr>
<td>Magnesium aluminum oxide (12068-51-8)</td>
<td>TWA</td>
<td>2 mg/m³</td>
<td></td>
</tr>
</tbody>
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<td>TWA</td>
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<td></td>
</tr>
<tr>
<td>Magnesium oxide (1309-48-4)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td>Fume.</td>
</tr>
</tbody>
</table>

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

<table>
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<td>Respirable.</td>
</tr>
<tr>
<td>Magnesium oxide (1309-48-4)</td>
<td>STEL</td>
<td>10 mg/m³</td>
<td>Respirable dust and/or fume.</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>3 mg/m³</td>
<td>Respirable dust and/or fume.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/m³</td>
<td>Inhalable fume.</td>
</tr>
</tbody>
</table>

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

<table>
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<td>10 mg/m³</td>
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### Canada. Quebec OELS. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

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</tr>
</thead>
<tbody>
<tr>
<td>Aluminum oxide (1344-28-1)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td>Total dust.</td>
</tr>
<tr>
<td>Magnesium oxide (1309-48-4)</td>
<td>TWA</td>
<td>10 mg/m³</td>
<td>Fume.</td>
</tr>
</tbody>
</table>

### Mexico. Occupational Exposure Limit Values

<table>
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<th>Material</th>
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<td>10 mg/m³</td>
<td>Fume.</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.
9. Physical & Chemical Properties

Appearance: Beige or white grain and powder.
Color: Beige or white.
Odor: Odorless.
Odor threshold: Not available.
Physical state: Solid.
Form: Powder and grains.

pH: 6 - 9.5
Melting point: 3875 °F (2135 °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: 3 - 3.4
Solubility (water): Not available.
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

<table>
<thead>
<tr>
<th>Product</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium aluminum Oxide (12068-51-8)</td>
<td>Acute Oral LD50 Rat: &gt; 5000 mg/kg</td>
</tr>
</tbody>
</table>

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

Aluminum oxide (CAS 1344-28-1) A4 Not classifiable as a human carcinogen.
Magnesium aluminum Oxide (CAS 12068-51-8)
A4 Not classifiable as a human carcinogen.
Magnesium oxide (CAS 1309-48-4)
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 EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration
Aluminum oxide (CAS 1344-28-1) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance
Aluminum oxide (CAS 1344-28-1) 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 CFR 355, Appendix A) No

Section 311/312 (40 CFR 370) No

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

WHMIS status Non-controlled

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>No</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>Yes</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>Yes</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>Yes</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>Yes</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>No</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>No</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</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
- Aluminum oxide (CAS 1344-28-1) Listed.
- Magnesium aluminum Oxide (CAS 12068-51-8) Listed.
- Magnesium oxide (CAS 1309-48-4) Listed.

US - Massachusetts RTK - Substance: Listed substance
- Aluminum oxide (CAS 1344-28-1) Listed.
- Magnesium oxide (CAS 1309-48-4) Listed.

US - New Jersey Community RTK (EHS Survey): Reportable threshold
- Aluminum oxide (CAS 1344-28-1) 500 LBS

US - New Jersey RTK - Substances: Listed substance
- Aluminum oxide (CAS 1344-28-1) Listed.
- Magnesium oxide (CAS 1309-48-4) Listed.

US - Pennsylvania RTK - Hazardous Substances: Listed substance
- Aluminum oxide (CAS 1344-28-1) Listed.
- Magnesium aluminum Oxide (CAS 12068-51-8) Listed.
- Magnesium oxide (CAS 1309-48-4) 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