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

1.1 Product identifier
   - Trade name: BARIUM FLUORIDE
   - Chemical name: Barium fluoride
   - Molecular formula: BaF₂

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

Uses of the Substance / Mixture
- Metallurgy.
- Welding and soldering agents
- Glass industry

1.3 Details of the supplier of the safety data sheet

Company
SOLVAY FLUORIDES, LLC
3737 Buffalo Speedway,
Suite 800,
Houston, TX 77098
USA
Tel: 800-515-6065

1.4 Emergency telephone
FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although WHMIS has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects

2.1 Classification of the substance or mixture

Hazardous Products Regulations (WHMIS 2015)
- Acute toxicity, Category 4: H332: Harmful if inhaled.
- Eye irritation, Category 2A: H319: Causes serious eye irritation.

2.2 Label elements

Hazardous Products Regulations (WHMIS 2015)

Pictogram

Signal Word
- Warning

Hazard Statements
Precautionary Statements

Prevention
- P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.
- P264 Wash skin thoroughly after handling.
- P271 Use only outdoors or in a well-ventilated area.
- P280 Wear eye protection/ face protection.

Response
- P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
- P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P337 + P313 If eye irritation persists: Get medical advice/ attention.

2.3 Other hazards which do not result in classification
- H402: Harmful to aquatic life.
- Presents hazards from its ionizing barium (action on the neuromuscular system).
- Chronic exposure (to the product) at high concentrations can cause bone fluorosis.

SECTION 3: Composition/information on ingredients

3.1 Substance

<table>
<thead>
<tr>
<th>WHMIS Hazardous Ingredients and Impurities</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Identification number CAS-No.</th>
<th>Concentration [% wt/wt or V/V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium fluoride (BaF2)</td>
<td>7787-32-8</td>
<td>&gt;= 99 - &lt; 100</td>
</tr>
</tbody>
</table>

3.2 Mixture

Not applicable, this product is a substance.

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation
- Oxygen or artificial respiration if needed.
- Move to fresh air.
- If symptoms persist, call a physician.

In case of skin contact
- Remove and wash contaminated clothing before re-use.
- Wash off with plenty of water.
- If symptoms persist, call a physician.

In case of eye contact

- H319 Causes serious eye irritation.
- H332 Harmful if inhaled.
In case of ingestion

- Call a physician immediately.
- Take victim immediately to hospital.
- If swallowed, rinse mouth with water (only if the person is conscious).
- Artificial respiration and/or oxygen may be necessary.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation

Effects
- May cause nose, throat, and lung irritation.
- Possible risk of irreversible effects through inhalation.

Repeated or prolonged exposure
- Risk of chronic bronchitis
- Risk of pulmonary overload (respirable particulates)

In case of skin contact

Effects
- slight irritation

In case of eye contact

Symptoms
- Redness
- Lachrymation

Effects
- Severe eye irritation

In case of ingestion

Effects
- Acute intoxication by inhalation or ingestion of water soluble barium salts causes vomiting, diarrhea, convulsive tremors and muscular paralysis.
- Risk of shock.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician
- Give to drink 30 grams of sodium sulfate in 250 ml of fresh water.
- Immediate medical attention is required.
- Medical examination necessary even only on suspicion of intoxication.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
- None.
5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- Not combustible.

Hazardous combustion products:

- The release of other hazardous decomposition products is possible.
- Barium oxide
- Other hazardous decomposition products may be formed.

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Keep people away from and upwind of spill/leak.
- Avoid dust formation.

Advice for emergency responders

- Wear self-contained breathing apparatus and protective suit.
- Sweep up to prevent slipping hazard.
- Prevent further leakage or spillage.

6.2 Environmental precautions

- Should not be released into the environment.
- Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

- Sweep up and shovel into suitable containers for disposal.
- Keep in properly labeled containers.

6.4 Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Use only in well-ventilated areas.
- Keep away from incompatible products
Hygiene measures

- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions

- Store in original container.
- Store in a well-ventilated place.
- Keep in a dry place.
- Keep container closed.
- Keep away from:
  - Incompatible products

Packaging material

Suitable material

- Paper.
- Polyethylene

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Consult local authorities for acceptable exposure limits.

<table>
<thead>
<tr>
<th>Components</th>
<th>Value type</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium fluoride (BaF2)</td>
<td>TWA</td>
<td>2.5 mg/m³</td>
<td>American Conference of Governmental Industrial Hygienists</td>
</tr>
</tbody>
</table>

Bone damage, Fluorosis, Substances for which there is a Biological Exposure Index or indices (see BEI® section), Not classifiable as a human carcinogen, varies

Expressed as Fluorine

Biological Exposure Indices

<table>
<thead>
<tr>
<th>Components</th>
<th>Value type</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium fluoride (BaF2)</td>
<td>BEI</td>
<td>2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)</td>
<td>American Conference of Governmental Industrial Hygienists</td>
</tr>
</tbody>
</table>
8.2 Exposure controls

Control measures

Engineering measures
- Provide appropriate exhaust ventilation at places where dust is formed.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection
- In case of insufficient ventilation, wear suitable respiratory equipment.
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- Self-contained breathing apparatus in confined spaces/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.
- In case of insufficient ventilation, wear suitable respiratory equipment.

Hand protection
- Impervious gloves

Suitable material
- PVC
- Natural Rubber

Unsuitable material
- Do not wear neoprene gloves, as neoprene absorbs nanoparticles.

Eye protection
- Chemical resistant goggles must be worn.

Skin and body protection
- Dust impervious protective suit

Hygiene measures
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Handle in accordance with good industrial hygiene and safety practice.
- Wash hands before breaks and at the end of workday.
SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th><strong>Appearance</strong></th>
<th>Form: Crystalline powder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physical state: solid</td>
</tr>
<tr>
<td></td>
<td>Color: white</td>
</tr>
<tr>
<td></td>
<td>Particle size: 3 - 8 µm , d 50</td>
</tr>
</tbody>
</table>

| **Odor** | odorless |

| **Odor Threshold** | No data available |

| **Molecular weight** | 175 g/mol |

| **pH** | 4.0 - 7.0 saturated aqueous solution |

| **Melting point/freezing point** | Melting point/range: 2,494 °F (1,368 °C) |

| **Initial boiling point and boiling range** | Boiling point/boiling range: 4,100 °F (2,260 °C) |

| **Flash point** | Not applicable |

| **Evaporation rate (Butylacetate = 1)** | Not applicable |

| **Flammability (solid, gas)** | The product is not flammable. |

| **Flammability / Explosive limit** | Explosiveness: Not explosive |

| **Autoignition temperature** | Not applicable |

| **Vapor pressure** | Not applicable, solid for which the melting point is > 300 °C / 572° F |

| **Vapor density** | Not applicable |

| **Density** | Bulk density: 1,000 - 1,500 kg/m3 |

| **Relative density** | 4.89 |

| **Solubility** | Water solubility: 1.5 g/l (68 °F (20 °C)) |

|                | Solubility in other solvents: |
|                | Formic acid : soluble |
|                | dimethyl sulfoxide : soluble |
**Partition coefficient: n-octanol/water**
Not applicable

**Decomposition temperature**
No data available

**Viscosity**
Viscosity, dynamic: Not applicable

**Explosive properties**
No data available

**Oxidizing properties**
Not considered as oxidizing.

9.2 Other information
No data available

---

**SECTION 10: Stability and reactivity**

10.1 Reactivity
- No data available

10.2 Chemical stability
- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
- No data available

10.4 Conditions to avoid
- No data available

10.5 Incompatible materials
- Incompatible with acids.

10.6 Hazardous decomposition products
- The release of other hazardous decomposition products is possible.
- Barium fluoride (BaF2)

---

**SECTION 11: Toxicological information**

11.1 Information on toxicological effects

**Acute toxicity**

**Acute oral toxicity**
LD50: > 2,000 mg/kg - Rat, female
Method: OECD Test Guideline 423
The product has a low acute toxicity
Unpublished reports
Acute inhalation toxicity

LC50 - 4 h (dust/mist): 1 - 5 mg/l - Rat, male and female
Method: OECD Test Guideline 403
This product is classified as acute toxicity category 4
Dust
Unpublished reports

Acute dermal toxicity
No data available

Acute toxicity (other routes of administration)
No data available

Skin corrosion/irritation

reconstructed human epidermis (RhE)
No skin irritation
Method: OECD Test Guideline 439
Unpublished reports

Serious eye damage/eye irritation

chicken
Irritating to eyes.
Method: OECD Test Guideline 438
Unpublished reports

Respiratory or skin sensitization

By analogy
Local lymph node assay - Mouse
Maximum Stimulation Index < 3
Not classified as sensitising by skin contact according to GHS criteria
Method: OECD Test Guideline 429
Test substance: Anhydrous barium chloride
Unpublished reports

Mutagenicity

Genotoxicity in vitro

By analogy
In vitro tests did not show mutagenic effects
Unpublished reports

Genotoxicity in vivo
No data available

Carcinogenicity
No data available

This product does not contain any ingredient designated as probable or suspected human carcinogens by:
ACGIH
Toxicity for reproduction and development

Toxicity to reproduction / fertility
By analogy
Rat, male and female, Oral
Animal testing did not show any effects on fertility.
Unpublished reports

Developmental Toxicity/Teratogenicity
Rat
By analogy
Rabbit, Oral
Result: No teratogenic effects.
Unpublished reports

STOT
STOT-single exposure
The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.

STOT-repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.
By analogy
Oral Subchronic exposure - Rat, male and female
Not considered to cause serious damage to health on repeated exposure

Experience with human exposure
No data available

Aspiration toxicity
No data available
SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish

By analogy

LC50 - 96 h: > 3.5 mg/l - Danio rerio (zebra fish)
static test
Test substance: Barium
Method: OECD Test Guideline 203
Unpublished reports

Acute toxicity to daphnia and other aquatic invertebrates

By analogy

EC50 - 48 h: 14.5 mg/l - Daphnia magna (Water flea)
static test
Analytical monitoring: yes
Test substance: Barium
Method: OECD Test Guideline 202
Unpublished reports

Toxicity to aquatic plants

By analogy

ErC50 - 72 h: > 1.15 mg/l - Pseudokirchneriella subcapitata (green algae)
static test
Analytical monitoring: yes
Test substance: Barium
Method: OECD Test Guideline 201
Unpublished reports

By analogy

NOEC - 72 h: > 1.15 mg/l - Pseudokirchneriella subcapitata (green algae)
static test
Analytical monitoring: yes
Endpoint: Growth rate
Test substance: Barium
Method: OECD Test Guideline 201
Unpublished reports
Toxicity to microorganisms

By analogy

NOEC - 3 h : 622 mg/l - activated sludge static test
Analytical monitoring: yes
Test substance: Barium
Method: OECD Test Guideline 209
Unpublished internal reports

Chronic toxicity to fish

By analogy

NOEC: > 1.26 mg/l - 33 Days - Danio rerio (zebra fish) semi-static test
Analytical monitoring: yes
Test substance: Barium
Method: OECD Test Guideline 210
Published data

Chronic toxicity to daphnia and other aquatic invertebrates

By analogy

NOEC: 2.9 mg/l - 21 Days - Daphnia magna (Water flea) semi-static test
Analytical monitoring: yes
Test substance: Barium
Method: OECD Test Guideline 211
Published data

12.2 Persistence and degradability

Abiotic degradation

Stability in water

Water/soil cation precipitation in presence of sulphates or carbonates,

Physical- and photo-chemical elimination

No data available

Biodegradation

Biodegradability

Not applicable
The methods for determining biodegradability are not applicable to inorganic substances.

Degradability assessment
12.3 Bioaccumulative potential

**Partition coefficient: n-octanol/water**
Not applicable, inorganic substance

**Bioconcentration factor (BCF)**
No data available

12.4 Mobility in soil

**Adsorption potential (Koc)**
Air
mobility as solid aerosols

Water/soil
low solubility and mobility

**Known distribution to environmental compartments**
No data available

12.5 Results of PBT and vPvB assessment
Not applicable

12.6 Other adverse effects

**Ecotoxicity assessment**

**Short-term (acute) aquatic hazard**
Harmful to aquatic life.

**Long-term (chronic) aquatic hazard**
No adverse chronic effect observed up to and including the threshold of 1 mg / L.

**SECTION 13: Disposal considerations**

13.1 Waste treatment methods

**Product Disposal**
- In accordance with local and national regulations.
- Refer to manufacturer/supplier for information on recovery/recycling.
- Dispose of wastes in an approved waste disposal facility.

**Advice on cleaning and disposal of packaging**
- Containers that cannot be cleaned must be treated as waste.
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.

**SECTION 14: Transport information**

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

**TDG**

14.1 UN number  
UN 1564

14.2 Proper shipping name  
BARIUM COMPOUND, N.O.S. (Barium fluoride)

14.3 Transport hazard class  
6.1

14.4 Packing group  
Packing group  III  
ERG No  154

14.5 Environmental hazards  
Marine pollutant  NO

**DOT**

14.1 UN number  
UN 1564

14.2 Proper shipping name  
BARIUM COMPOUNDS, N.O.S. (Barium fluoride)

14.3 Transport hazard class  
6.1

14.4 Packing group  
Packing group  III  
ERG No  154

14.5 Environmental hazards  
Marine pollutant  NO

**NOM**

14.1 UN number  
UN 1564

14.2 Proper shipping name  
BARIUM COMPOUND, N.O.S. (Barium fluoride)

14.3 Transport hazard class  
6.1

14.4 Packing group  
Packing group  III  
ERG No  154

14.5 Environmental hazards  
Marine pollutant  NO

**IMDG**
14.1 UN number
UN 1564

14.2 Proper shipping name
BARIUM COMPOUND, N.O.S. (Barium fluoride)

14.3 Transport hazard class
Label(s): 6.1

14.4 Packing group
Packing group III

14.5 Environmental hazards
Marine pollutant NO

14.6 Special precautions for user
EmS F-A, S-A

For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.
SECTION 15: Regulatory information

15.1 Notification status

<table>
<thead>
<tr>
<th>Inventory Information</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States TSCA Inventory</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Mexico INSQ (INSQ)</td>
<td>In compliance with the inventory</td>
</tr>
<tr>
<td>Canadian Domestic Substances List (DSL)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>New Zealand. Inventory of Chemical Substances</td>
<td>In compliance with the inventory</td>
</tr>
<tr>
<td>Australia Inventory of Chemical Substances (AICS)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Japan. CSCL - Inventory of Existing and New Chemical Substances</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Korea. Korean Existing Chemicals Inventory (KECI)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>China. Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Philippines Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Listed on Inventory</td>
</tr>
</tbody>
</table>

- When purchased from a European Solvay legal entity, this product is compliant with the registration provisions of the REACH Regulation (EC) No. 1907/2006 as all its components are either excluded, exempt, and/or registered. When purchased from a legal entity outside of Europe, please contact your local representative for additional information.

15.2 National Regulations

Canada. CEPA 1999 Significant New Activity (SNAc) List:
- No substances are subject to a Significant New Activity Notification.

SECTION 16: Other information

Revision Date:
10/15/2018

NFPA (National Fire Protection Association) - Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>2 moderate</td>
</tr>
<tr>
<td>Flammability</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Instability or Reactivity</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Special Notices</td>
<td>None</td>
</tr>
</tbody>
</table>
SAFETY DATA SHEET

BARIUM FLUORIDE

Revision Date   10/15/2018

<table>
<thead>
<tr>
<th>HMIS (Hazardous Materials Identification System (Paint &amp; Coating)) - Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
</tr>
<tr>
<td>Flammability</td>
</tr>
<tr>
<td>Reactivity</td>
</tr>
<tr>
<td>PPE</td>
</tr>
</tbody>
</table>

Key or legend to abbreviations and acronyms used in the safety data sheet

- PEL: Permissible exposure limit
- TWA: 8-hour, time-weighted average
- ACGIH: American Conference of Governmental Industrial Hygienists
- OSHA: Occupational Safety and Health Administration
- NTP: National Toxicology Program
- IARC: International Agency for Research on Cancer
- NIOSH: National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.