1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Hafnium(IV) fluoride
Brand: SAM

CAS-No.: 13709-52-9

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

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Stanford Advanced Materials
23661 Birtcher Dr.
Lake Forest, CA 92630
USA

Telephone: +1 (949) 407-8904
Fax: +1 (949) 812-6690

1.4 Emergency telephone number

Emergency Phone #: +1 (949) 407-8904

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Inhalation (Category 3), H331
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger
Hazard statement(s)
H315 Causes skin irritation.
H318 Causes serious eye damage.
H331 Toxic if inhaled.
H335 May cause respiratory irritation.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Immediately call a POISON CENTER/doctor.

Specific treatment (see supplemental first aid instructions on this label).

If skin irritation occurs: Get medical advice/attention.

Take off contaminated clothing and wash before reuse.

Store in a well-ventilated place. Keep container tightly closed.

Store locked up.

Dispose of contents/container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Contact with water liberates toxic gas.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula: \( \text{F}_4\text{Hf} \)
Molecular weight: 254.48 g/mol
CAS-No.: 13709-52-9
EC-No.: 237-258-0

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium(IV) fluoride</td>
<td>Acute Tox. 3; Skin Irrit. 2; Eye Dam. 1; STOT SE 3; H315, H318, H331, H335</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
No data available
5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Do not flush with water. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Never allow product to get in contact with water during storage.
Keep in a dry place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSO

PROTECTION 8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium(IV) fluoride</td>
<td>13709-52-9</td>
<td>TWA</td>
<td>2.500000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks CAS number varies with compound</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>2.500000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Z37.28-1969</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>2.500000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Bone damage Fluorosis</td>
<td></td>
<td></td>
<td></td>
<td>Bone damage Fluorosis Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen varies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>0.500000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Upper Respiratory Tract irritation Eye irritation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Liver damage

<table>
<thead>
<tr>
<th>TWA</th>
<th>0.500000 mg/m³</th>
<th>USA, NIOSH Recommended Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>2.500000 mg/m³</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</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

| TWA | 2.5 mg/m³ | USA, ACGIH Threshold Limit Values (TLV) |

### CAS number varies with compound

| TWA | 0.5 mg/m³ | USA, ACGIH Threshold Limit Values (TLV) |

### Upper Respiratory Tract irritation

Eye irritation

Liver damage

| TWA | 2.5 mg/m³ | USA, ACGIH Threshold Limit Values (TLV) |

### Bone damage

- Fluorosis

Substances for which there is a Biological Exposure Index or Indices (see BEI® section)

Not classifiable as a human carcinogen varies

<table>
<thead>
<tr>
<th>TWA</th>
<th>0.5 mg/m³</th>
<th>USA, NIOSH Recommended Exposure Limits</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium(IV) fluoride</td>
<td>13709-52-9</td>
<td>Fluoride</td>
<td>3.0000 mg/g</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prior to shift (16 hours after exposure ceases)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluoride</td>
<td>10.0000 mg/g</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of shift (As soon as possible after exposure ceases)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluoride</td>
<td>2 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Prior to shift (16 hours after exposure ceases)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluoride</td>
<td>3 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>End of shift (As soon as possible after exposure ceases)</td>
</tr>
</tbody>
</table>

### Exposure controls

**Appropriate engineering controls**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.
Personal protective equipment

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Appearance</td>
<td>Form: powder</td>
</tr>
<tr>
<td></td>
<td>Colour: beige</td>
</tr>
<tr>
<td>b) Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>c) Odour Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>d) pH</td>
<td>No data available</td>
</tr>
<tr>
<td>e) Melting point/freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>No data available</td>
</tr>
<tr>
<td>g) Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>h) Evaporation rate</td>
<td>No data available</td>
</tr>
<tr>
<td>i) Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>j) Upper/lower flammability or explosive limits</td>
<td>No data available</td>
</tr>
<tr>
<td>k) Vapour pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>No data available</td>
</tr>
<tr>
<td>m) Relative density</td>
<td>No data available</td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>No data available</td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>p) Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>q) Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>r) Viscosity</td>
<td>No data available</td>
</tr>
<tr>
<td>s) Explosive properties</td>
<td>No data available</td>
</tr>
</tbody>
</table>
t) Oxidizing properties
No data available

9.2 Other safety information
No data available

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
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
Strong oxidizing agents, acids

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hafnium oxide
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available
Aspiration hazard
No data available

Additional Information
RTECS: Not available
Salivation, Nausea, Vomiting, Fever. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3288    Class: 6.1    Packing group: III
Proper shipping name: Toxic solid, inorganic, n.o.s. (Hafnium(IV) fluoride)

Poison Inhalation Hazard: No

IMDG
UN number: 3288    Class: 6.1    Packing group: III    EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, INORGANIC, N.O.S. (Hafnium(IV) fluoride)

IATA
UN number: 3288    Class: 6.1    Packing group: III
Proper shipping name: Toxic solid, inorganic, n.o.s. (Hafnium(IV) fluoride)

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard
**Massachusetts Right To Know Components**
No components are subject to the Massachusetts Right to Know Act.

**Pennsylvania Right To Know Components**

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>13709-52-9</td>
<td>2008-06-01</td>
</tr>
</tbody>
</table>

**New Jersey Right To Know Components**

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>13709-52-9</td>
<td>2008-06-01</td>
</tr>
</tbody>
</table>

**California Prop. 65 Components**
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

### 16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

- **Acute Tox.**
  - H315: Causes skin irritation.
  - H318: Causes serious eye damage.
  - H331: Toxic if inhaled.
  - H335: May cause respiratory irritation.

**Skin Irrit.**
- Skin irritation

**STOT SE**
- Specific target organ toxicity - single exposure

### HMIS Rating

- Health hazard: 4
- Chronic Health Hazard:
- Flammability: 0
- Physical Hazard: 0

### NFPA Rating

- Health hazard: 4
- Fire Hazard: 0
- Reactivity Hazard: 0

**Further information**
This material safety data sheet is offered solely for your information, consideration, and investigation. Stanford Advanced Materials provides no warranties, either express or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein.