SECTION 1: IDENTIFICATION OF THE PRODUCT AND OF THE COMPANY

1.1 Product identifiers

Product Name: ACS Material Highly Oriented Pyrolytic Graphite
Brand: ACS Material LLC
CAS-No.: 7440-44-0

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

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company: ACS MATERIAL LLC
959 E Walnut St., Suite 100
Pasadena, CA 91106
USA
Telephone: +1 (866)-227-0656
Fax: +1 (781)-518-0284

1.4 Emergency telephone number

Emergency Phone #: +1 (866)-227-0656

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

None.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Substance name: ACS Material Highly Oriented Pyrolytic Graphite
Synonyms: HOPG
CAS-No.: 7440-44-0
EC-No.: 231-153-3
Molecular weight: 12.01 g/mol
Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
<th>CAS-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphite</td>
<td>&gt;99.99%</td>
<td>7440-44-0</td>
</tr>
</tbody>
</table>

For the full text of the phrases mentioned in this Section, see Section 16.

Hazardous impurities: None known.

SECTION 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 inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.
Get medical attention if irritation occurs.

If swallowed
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

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.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

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.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of open flames and sparks, of heat, of oxidizing materials.


5.4 Further information

Special Remarks on Fire Hazards:
It will ignite on contact with chlorine trifluoride and fluorine. Graphite dust may ignite on contact with air. May re-ignite after fire is extinguished.

Special Remarks on Explosion Hazards:
Material in powder form, capable of creating an explosion on contact with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.

For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

6.4 Reference to other sections
SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Suitable extinguishing media

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control Parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphite</td>
<td>7440-44-0</td>
<td>TWA</td>
<td>2.000000 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td>Inhalation Respirable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>2.500000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PEL</td>
<td>2.500000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>10 mg/m³</td>
<td>UK Recommended Exposure Limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>4 mg/m³</td>
<td>UK Recommended Exposure Limits</td>
<td></td>
</tr>
</tbody>
</table>

8.2 Exposure controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
Appropriate engineering controls
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal protective equipment

Eye/face protection
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
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific workplace. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Do not let product enter drains.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

1) Appearance
   Form: solid
   Colour: black

2) Odour
   odourless

3) Odour Threshold
   No data available

4) pH
   No data available

5) Melting point/freezing point
   3650°C (6602°F)
9.2 Other safety 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
Reacts vigorously with liquid potassium, and potassium peroxide. If graphite contacts liquid potassium, rubidium or caesium at 300 °C, intercalation compounds may be formed.

10.4 Conditions to avoid
Heat, spark, flame or other fire origin, heat up to 290 °C (554 °F).

10.5 Incompatible materials
Strong oxidizing agents, fluorine-containing reagents, peroxide.

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - No data available.
Other decomposition products - No data available.
In the event of fire: see section 5.
SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50: Not available.
LC50: Not available.
Dermal: No data available.
No data available.

Skin corrosion/irritation
Causes skin irritation.

Serious eye damage/eye irritation
Dust causes eye irritation.

Respiratory or skin sensitisation
Dust causes respiratory tract and mucous membrane irritation.

Germ cell mutagenicity
Not 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.

Specific target organ toxicity - single exposure
No data available.

Specific target organ toxicity - repeated exposure
Causes damage to the following organs: upper respiratory tract.
May cause damage to the following organs: cardiovascular system.
Inhalation of high concentrations of graphite dust over prolonged periods of time may cause pneumoconiosis. Symptoms can include cough, shortness of breath, and decrease of pulmonary function. Preexisting pulmonary disorders such as emphysema may possibly be aggravated by prolonged exposure to high concentrations of graphite dust.

Aspiration hazard
No data available.

Additional Information
RTECS: No data available.
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity
No data available.

12.2 Persistence and degradability
No data available.

12.3 Bioaccumulative potential
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise. The product itself and its products of degradation are not toxic.

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.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Contaminated packaging
Dispose of as unused product.

SECTION 14: TRANSPORT INFORMATION

UN number
ADR/RID: - IMDG: - IATA: -

UN proper shipping name
ADR/RID: Not dangerous goods.
IMDG: Not dangerous goods.
IATA: Not dangerous goods.

**Transport hazard class(es)**
ADR/RID: - IMDG: - IATA: -

**Packaging group**
ADR/RID: - IMDG: - IATA: -

**Environmental hazards**
ADR/RID: no IMDG Marine pollutant: no IATA: no

**Special precautions for user**
No data available.

### SECTION 15: REGULATORY INFORMATION

15.1 **Safety, health and environmental regulations/legislation specific for the substance or mixture**

**Authorisations and/or restrictions on use**

**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**
No SARA Hazards.

**Massachusetts Right To Know Components**

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-44-0</td>
<td>1989-08-11</td>
</tr>
</tbody>
</table>

**Pennsylvania Right To Know Components**

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-44-0</td>
<td>1989-08-11</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>7440-44-0</td>
<td>1989-08-11</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.
SECTION 16: OTHER INFORMATION

HMIS Classification
Health hazard: 0
Chronic Health Hazard: 0
Flammability: 0
Physical Hazard: 0

NFPA Rating
Health hazard: 0
Fire Hazard: 0
Reactivity Hazard: 0

Disclaimer: ACS Material, LLC believes that the information in this Safety Data Sheet is accurate and represents the best and most current information available to us. ACS Material makes no representations or warranties either express or implied, regarding the suitability of the material for any purpose or the accuracy of the information contained within this document. Accordingly, ACS Material will not be responsible for damages resulting from use of or reliance upon this information.