1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Identification of the substance/preparation: C46™ Cement
Use of the substance/preparation: Bonding of Carbon and Graphite.
Version No.: 04
CAS No.: Mixture
SDS Number: 4027
Manufacturer: GrafTech South Africa (Pty) Ltd.
Supplier: GrafTech International Holdings Inc.

Emergency telephone: For Chemical Emergency ONLY, call CHEMTREC at: 0-800-983-611, +1-703-527-3887

Manufacturer: GrafTech South Africa (Pty) Ltd.
PO Box 43
Meyerton 1960 Gauteng
South Africa
+2716-360-3250

Emergency telephone: For Chemical Emergency ONLY, call CHEMTREC at: 0-800-983-611, +1-703-527-3887

Manufacturer: GrafTech International Holdings Inc.
12900 Snow Road
Parma, Ohio 44130
1-216-676-2000

Contact person: Dave Mieskowski +1 216-676-2304
e-mail: Dave.Mieskowski@graftech.com

2. HAZARDS IDENTIFICATION

This preparation is classified as dangerous according to Directive 1999/45/EC and its amendments.

Classification: Carc. Cat. 1;R45, Muta. Cat. 2;R46, Repr. Cat. 2;R60-61, N;R50/53
Physical hazards: Not classified as a physical hazard.
Health hazards: May cause cancer. May cause heritable genetic damage. May impair fertility. May cause harm to the unborn child.

Environmental hazards: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Specific hazards: High concentrations: Vapours may irritate throat and respiratory system and cause coughing. May cause damage to mucous membranes in nose, throat, lungs and bronchial system. High concentration of coal tar pitch fumes are irritating to eyes. High concentrations of coal tar pitch liquid, vapours, or fumes may be irritating to the skin. May cause photosensitisation, evidenced by repeated occurrence of a dermatitic rash on exposure to sunlight. Repeated exposure to coal tar products may increase the risk of more serious skin disorders including a variety of skin cancers. Some skin cancers, such as malignant melanoma, have a high mortality rate. Pre-existing skin and respiratory conditions including dermatitis, asthma and chronic lung disease might be aggravated by exposure. May cause central nervous system effects. May cause damage to the kidneys.

Main symptoms: Eye contact: Exposed individuals may experience eye tearing, redness, and discomfort. Ingestion may cause nausea, headache and dizziness.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS No.</th>
<th>Percent</th>
<th>EC-No.</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphite</td>
<td>7782-42-5</td>
<td>10-30</td>
<td>231-955-3</td>
<td></td>
</tr>
<tr>
<td>Pitch, coal tar, high-temp</td>
<td>65996-93-2</td>
<td>10-30</td>
<td>266-028-2</td>
<td>Carc. Cat. 1;R45, Muta. Cat. 2;R46, Repr. Cat. 2;R60-61, N;R50/53, PBT, vPvB</td>
</tr>
<tr>
<td>Amorphous silica</td>
<td>69012-64-2</td>
<td>5-10</td>
<td>231-545-4</td>
<td></td>
</tr>
<tr>
<td>Carbon black</td>
<td>1333-86-4</td>
<td>5-10</td>
<td>215-609-9</td>
<td></td>
</tr>
<tr>
<td>Sulphur</td>
<td>7704-34-9</td>
<td>1-5</td>
<td>231-722-6</td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol</td>
<td>107-21-1</td>
<td>&lt; 5</td>
<td>203-473-3</td>
<td></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. The full text for all R-phrases is displayed in section 16 of the SDS.
4. FIRST-AID MEASURES

**Inhalation**
Move injured person into fresh air and keep person calm under observation. If breathing stops, provide artificial respiration. Get medical attention.

**Skin contact**
Remove contaminated clothing. Wash contact areas with soap and water. Get medical attention promptly if symptoms occur after washing. If skin irritation or an allergic skin reaction develops, get medical attention.

**Eye contact**
Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

**Ingestion**
Rinse mouth thoroughly. Give one or two glasses of water if patient is alert and able to swallow. Seek immediate medical attention. Do not induce vomiting.

**General advice**
First aid personnel must be aware of own risk during rescue.

**Notes to physician**
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

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

**Extinguishing media which must not be used for safety reasons**
None.

**Unusual fire & explosion hazards**
If strongly heated, the product releases PAHs, which include carcinogenic substances.

**Specific hazards**
Thermal decomposition may produce smoke, oxides of carbon and lower molecular weight organic compounds whose composition have not been characterised. If strongly heated, the product releases PAHs, which include carcinogenic substances.

**Special protective equipment for fire-fighters**
Use standard firefighting procedures and consider the hazards of other involved materials. Caution should be exercised when using water or foam as frothing may occur, especially if directed onto containers of hot or burning material.

**Fire fighting equipment/instructions**
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

**Hazardous combustion products**

6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Avoid inhalation of vapours. Avoid contact with skin and eyes. In case of spills, beware of slippery floors and surfaces. Wear suitable protective clothing and gloves. See Section 8 of the SDS for Personal Protective Equipment.

**Environmental precautions**
Do not allow material to enter storm or sanitary sewers, groundwater or soil.

**Methods for cleaning up**
Spilled and released material should picked up with a suitable implement. Collect in approved containers and seal securely. Containers must be labeled. For waste disposal, see section 13 of the SDS.

7. HANDLING AND STORAGE

**Handling**
Pregnant women should not work with the product, if there is the least risk of exposure. People working with this product should get instructions before use. This product should only be used in an industrial workplace. Work practice should minimise contact. Should be handled in closed systems, if possible. Use process enclosures, local exhaust ventilation, or other engineering controls to control sources of dust, mist or vapour. Use work methods which minimise production of vapours and mists. Do not breathe vapour. Avoid contact with skin and eyes. Wear appropriate personal protective equipment. Ensure that waste and contaminated materials are collected and removed from the work area as soon as possible in a suitably labelled container. Keep the workplace clean. Observe good industrial hygiene practices.

**Storage**
Keep away from heat, spark, open flames and other sources of ignition. Store away from incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Occupational exposure limits**

US. ACGIH Threshold Limit Values

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon black (CAS 1333-86-4)</td>
<td>TWA</td>
<td>3 mg/m3</td>
<td>Inhalable fraction.</td>
</tr>
<tr>
<td>Ethylene glycol (CAS 107-21-1)</td>
<td>Ceiling</td>
<td>100 mg/m3</td>
<td>Aerosol</td>
</tr>
<tr>
<td>Graphite (CAS 7782-42-5)</td>
<td>TWA</td>
<td>2 mg/m3</td>
<td>Respirable fraction.</td>
</tr>
<tr>
<td>Pitch, coal tar, high-temp (CAS 65996-93-2)</td>
<td>TWA</td>
<td>0.2 mg/m3</td>
<td>Aerosol</td>
</tr>
</tbody>
</table>
Egypt. OELs. Threshold limits for carcinogens and suspected carcinogens (Decree No. 388, Annex 8)

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch, coal tar, high-temp (CAS 65996-93-2)</td>
<td>TWA</td>
<td>0.2 mg/m³</td>
</tr>
</tbody>
</table>

Egypt. OELs. Threshold limits of air pollutants in the workplace (Decree No. 388, Annex 8)

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous silica (CAS 69012-64-2)</td>
<td>TWA</td>
<td>20 million particles/ft</td>
<td></td>
</tr>
<tr>
<td>Carbon black (CAS 1333-86-4)</td>
<td>TWA</td>
<td>3.5 mg/m³</td>
<td>Total dust.</td>
</tr>
<tr>
<td>Ethylene glycol (CAS 107-21-1)</td>
<td>Ceiling</td>
<td>100 mg/m³</td>
<td>Aerosol</td>
</tr>
<tr>
<td>Graphite (CAS 7782-42-5)</td>
<td>TWA</td>
<td>39.4 ppm</td>
<td>Aerosol</td>
</tr>
</tbody>
</table>

South Africa. Recommended Exposure Limits (RELS) Regulations for Hazardous Chemical Substances, Table 2

<table>
<thead>
<tr>
<th>Components</th>
<th>Type</th>
<th>Value</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous silica (CAS 69012-64-2)</td>
<td>TWA</td>
<td>6 mg/m³</td>
<td>Total inhalable dust.</td>
</tr>
<tr>
<td>Carbon black (CAS 1333-86-4)</td>
<td>STEL</td>
<td>3 mg/m³</td>
<td>Respirable dust.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol (CAS 107-21-1)</td>
<td>STEL</td>
<td>125 mg/m³</td>
<td>Vapor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 mg/m³</td>
<td>Particulate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/m³</td>
<td></td>
</tr>
<tr>
<td>Graphite (CAS 7782-42-5)</td>
<td>TWA</td>
<td>5 mg/m³</td>
<td>Respirable dust.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/m³</td>
<td>Total inhalable dust.</td>
</tr>
<tr>
<td>Pitch, coal tar, high-temp (CAS 65996-93-2)</td>
<td>TWA</td>
<td>0.14 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Recommended monitoring procedures

Additional exposure data

Engineering measures

Provide adequate general and local exhaust ventilation. Mechanical ventilation or local exhaust ventilation is required. Provide explosion proof ventilation for high concentrations. Observe occupational exposure limits and minimise the risk of inhalation of dust, fumes and vapours.

Personal protective equipment

Respiratory protection

Respiratory protection must be used if air contamination exceeds acceptable level. Personal protective equipment should be chosen according to the applicable standards and in discussion with the supplier of the personal protective equipment. Seek advice from supervisor on the company’s respiratory protection standards.

Hand protection

Wear protective gloves. Rubber or vinyl-coated gloves are recommended. Suitable gloves can be recommended by the glove supplier.

Eye protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Wear appropriate clothing to prevent repeated or prolonged skin contact. Chemical/oil resistant clothing is recommended.

General

Personal protective equipment should be chosen according to the applicable standards and in discussion with the supplier of the personal protective equipment. Personal protective equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.

Environmental exposure controls

Environmental manager must be informed of all significant spillages.

Hygiene measures

Do not eat, drink or smoke when using the product. Do not store food, drink and tobacco near the product. Wash at the end of each work shift and before eating, smoking or using the toilet. Routinely wash work clothing and protective equipment to remove contaminants. Private clothes and working clothes should be kept separately. Always observe national occupational health and hygiene requirements including requirements for medical surveillance.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid.</td>
<td>Paste.</td>
</tr>
</tbody>
</table>
Colour: Black.
Odour: Pitch.
Odour threshold: Not applicable.
\( \text{pH} \): Not applicable.
Melting point/freezing point: Not applicable.
Boiling point, initial boiling point, and boiling range: Not applicable.
Flash point: Not applicable.
Auto-ignition temperature: Not applicable.
Flammability limit - lower (%): Not applicable.
Flammability limit - upper (%): Not applicable.
Vapour pressure: Not applicable.
Vapour density: Not applicable.
Evaporation rate: Not applicable.
Density: No data available.
Solubility: Slightly soluble in water.
Partition coefficient (n-octanol/water): Not applicable.
Decomposition temperature: Not available.
Bulk density: 80 lb/ft\(^3\)
Viscosity: Not applicable.
Other data:
  - Percent volatile: Not applicable.
  - Relative density: 1 - 1.5 (20°C)

10. STABILITY AND REACTIVITY

Conditions to avoid: None in particular.
Stability: Material is stable under normal conditions.
Materials to avoid: Strong oxidising agents.
Hazardous polymerisation: Will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological data

<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous silica (CAS 69012-64-2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>Rat</td>
<td>&gt; 22500 mg/kg</td>
</tr>
<tr>
<td>LD50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethylene glycol (CAS 107-21-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dermal</td>
<td>Rabbit</td>
<td>9530 mg/kg</td>
</tr>
<tr>
<td>LD50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>Rat</td>
<td>4700 mg/kg</td>
</tr>
<tr>
<td>LD50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute toxicity</td>
<td></td>
<td>No data available for this product.</td>
</tr>
<tr>
<td>Routes of exposure</td>
<td></td>
<td>Eye contact. Skin contact. Inhalation. Ingestion.</td>
</tr>
<tr>
<td>Chronic toxicity</td>
<td></td>
<td>Pre-existing respiratory conditions including asthma and chronic lung disease might be aggravated by exposure. May cause central nervous system effects. May cause damage to the kidneys. Chronic exposure may cause conjunctivitis, blepharoconjunctivitis and photophobia.</td>
</tr>
<tr>
<td>Sensitisation</td>
<td></td>
<td>May cause photosensitisation, evidenced by repeated occurrence of a dermatitic rash on exposure to sunlight.</td>
</tr>
</tbody>
</table>
Carcinogenicity

The coal tar pitch component of this formulation contains polynuclear aromatic hydrocarbons (PAHs). Some PAHs are recognized carcinogens and may cause skin, lung and bladder cancer. Prolonged and repeated contact with the product may cause skin cancer. Some skin cancers, such as malignant melanoma, have a high mortality rate.

IARC Monographs. Overall Evaluation of Carcinogenicity

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amorphous silica (CAS 69012-64-2)</td>
<td>3 Not classifiable as to carcinogenicity to humans.</td>
</tr>
<tr>
<td>Carbon black (CAS 1333-86-4)</td>
<td>2B Possibly carcinogenic to humans.</td>
</tr>
<tr>
<td>Pitch, coal tar, high-temp (CAS 65996-93-2)</td>
<td>1 Carcinogenic to humans.</td>
</tr>
</tbody>
</table>

Mutagenicity

May cause genetic defects.

Teratogenicity

No data available.

Reproductivity

May impair fertility. May cause harm to the unborn child.

Local effects

High concentration of coal tar pitch fumes are irritating to eyes. High concentrations of coal tar pitch liquid, vapours, or fumes may be irritating to the skin. Prolonged exposure is associated with lung cancer and urinary cancer.

Symptoms and target organs

Eye contact: Exposed individuals may experience eye tearing, redness, and discomfort. Ingestion may cause dizziness, nausea and vomiting. Inhalation: May cause damage to mucous membranes in nose, throat, lungs and bronchial system. High concentrations: Vapours may irritate throat and respiratory system and cause coughing.

12. ECOLOGICAL INFORMATION

Ecotoxicological data

<table>
<thead>
<tr>
<th>Components</th>
<th>Species</th>
<th>Test results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene glycol (CAS 107-21-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Aquatic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>LC50</td>
<td>Fathead minnow (Pimephales promelas) 8050 mg/l, 96 hours</td>
</tr>
<tr>
<td><strong>Ecotoxicity</strong></td>
<td></td>
<td>Very toxic to aquatic life with long lasting effects. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.</td>
</tr>
<tr>
<td><strong>Persistence and degradability</strong></td>
<td></td>
<td>The degradability of the product has not been stated.</td>
</tr>
<tr>
<td>Bioaccumulation</td>
<td></td>
<td>No data available on bioaccumulation.</td>
</tr>
<tr>
<td><strong>Bioaccumulative potential</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octanol/water partition coefficient</td>
<td>1.36</td>
<td>Ethylene glycol (CAS 107-21-1)</td>
</tr>
<tr>
<td>Aquatic toxicity</td>
<td></td>
<td>No data available for this product.</td>
</tr>
<tr>
<td>Mobility</td>
<td></td>
<td>The product is slightly soluble in water.</td>
</tr>
<tr>
<td>Other adverse effects</td>
<td></td>
<td>None known.</td>
</tr>
</tbody>
</table>

13. DISPOSAL CONSIDERATIONS

Disposal instructions

Disposal recommendations are based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal. Waste must be kept in sealed and labeled containers. Recover and reclaim or recycle, if practical.

Waste from residues / unused products

Dispose of waste and residues in accordance with local authority requirements.

Contaminated packaging

Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. TRANSPORT INFORMATION

ADR

UN number: UN3077
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pitch, coal tar, high-temp)
Hazard class: 9
Packing group: III
Environmental hazards: Yes
Marine pollutant: 9
Hazard ID: 90
Item: M7
Transport category: 3

IATA

UN number: UN3077
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pitch, coal tar, high-temp)
Hazard class: 9
Packing group: III
Environmental hazards
  Marine pollutant          Yes
  Labels required          Yes
  ERG code                 9L

IMDG
  UN number                UN3077
  Proper shipping name    ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Pitch, coal tar, high-temp)
  Hazard class            9
  Packing group           III
  EmS                     F-A, S-F
  Environmental hazards
    Marine pollutant      Yes
  Labels required        9

General
The transportation information provided represents the regulatory transport classification of the product without consideration to packaging, quantity, or modal restrictions and exceptions. It is the user’s responsibility to determine the appropriate packaging and modal requirements and/or limitations for the product quantity being shipped.

15. REGULATORY INFORMATION

Labelling
  Contains                  Pitch, coal tar, high-temp
  Symbol(s)
    Toxic
    Dangerous for the environment

R-phrase(s)
  R45 May cause cancer.
  R46 May cause heritable genetic damage.
  R60 May impair fertility.
  R61 May cause harm to the unborn child.
  R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S-phrase(s)
  S23 Do not breathe fumes, vapour.
  S24 Avoid contact with skin.
  S36/37 Wear suitable protective clothing and gloves.
  S45 In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
  S53 Avoid exposure - obtain special instructions before use.
  S57 Use appropriate container to avoid environmental contamination.
  S60 This material and its container must be disposed of as hazardous waste.
  S61 Avoid release to the environment. Refer to special instructions/ Safety data sheets.

Young people under 18 years old are not allowed to work with this product according to the EU Directive 94/33/EC on the protection of young people at work. Pregnant women should not work with the product, if there is the least risk of exposure.

Regulatory information
Restricted to professional users.

16. OTHER INFORMATION

Wording of the R-phrases in sections 2 and 3
  R22 Harmful if swallowed.
  R36 Irritating to skin.
  R45 May cause cancer.
  R46 May cause heritable genetic damage.
  R50 Very toxic to aquatic organisms.
  R50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
  R53 May cause long-term adverse effects in the aquatic environment.
  R60 May impair fertility.
  R61 May cause harm to the unborn child.

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>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Country(s) or region</td>
<td>Inventory name</td>
<td>On inventory (yes/no)*</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
</tbody>
</table>

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s). A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).*

**Further information**
This safety data sheet contains revisions in the following section(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

**Other information**
PBT: Persistent, bioaccumulative and toxic.
vPvB: Very Persistent and very Bioaccumulative.

**Disclaimer**
GRAFTECH INTERNATIONAL HOLDINGS INC. ADVISES THE USERS OF THIS PRODUCT TO STUDY THIS SAFETY DATA SHEET (SDS) AND BECOME AWARE OF PRODUCT HAZARDS AND SAFETY INFORMATION. TO PROMOTE SAFE USE OF THIS PRODUCT, USERS SHOULD NOTIFY THEIR EMPLOYEES, AGENTS AND CONTRACTORS OF THE INFORMATION ON THIS MSDS AND ANY PRODUCT HAZARDS AND SAFETY INFORMATION.

This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

**Issue date** 01-November-2011
**Revision date** 23-December-2013