MATERIAL SAFETY DATA SHEET

Product: ULTRA FLUX SILVER BRAZING FLUX

SECTION I: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Common Name : BRAZING FLUX
Chemical Name : CHEMICAL MIXTURE
Formula : CHEMICAL MIXTURE
Product CAS No. : CHEMICAL MIXTURE
Product Use : Welding/Brazing

Supplier : ENGELHARD CORPORATION, ENGINEERED MATERIALS GROUP
Address : 235 KILVERT STREET
City, St, Zip : WARWICK, RI 02886
Phone : 1-401-739-9550

FOR CHEMICAL EMERGENCY CALL CHEMTREC (24 HOURS):
1-800-424-9300 (US, Canada, Puerto Rico, Virgin Islands)
1-202-483-7616 (Outside Above Area)

SECTION II: COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>CAS NO.</th>
<th>% Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTASSIUM TETRABORATE</td>
<td>1332-77-0</td>
<td>30-40</td>
</tr>
<tr>
<td>BORIC ACID</td>
<td>10043-35-3</td>
<td>20-30</td>
</tr>
<tr>
<td>POTASSIUM PENTABORATE</td>
<td>11128-29-3</td>
<td>1-5</td>
</tr>
<tr>
<td>POTASSIUM BIFLUORIDE</td>
<td>7789-29-9</td>
<td>20-30</td>
</tr>
</tbody>
</table>
INGREDIENT NOTES

NOTE: The percentage by weight values reported for the ingredients in this product represent approximate formulation values.

NOTE: See Section VIII for Exposure Limits and Section XI for Toxicological Information.

SECTION III: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

White paste

Odorless

Flash Point: Not Applicable

May cause eye, skin and respiratory tract irritation. Causes burns which are not immediately visible or painful. Harmful if inhaled, swallowed or absorbed through skin. May cause abdominal pain, diarrhea, vomiting, excess salivation, thirst, perspiration and spasms. Large amounts may be fatal. Inhalation may cause nasal discharge, nosebleed, cough, sore throat, labored breathing, bronchospasm, pulmonary edema and systemic toxicity. Prolonged or repeated inhalation and ingestion may cause delayed injury involving the kidneys and the blood, gastrointestinal, nervous and reproductive systems. Not a fire or explosion hazard. However, toxic and corrosive fluoride compounds may be released in a fire situation.

ROUTES OF ENTRY

Eyes? YES  Skin? YES  Inhalation? YES  Ingestion? YES

POTENTIAL HEALTH EFFECTS

EYE CONTACT causes irritation and may cause burns.

SKIN CONTACT may cause fluoride burns which may not be immediately painful or evident, especially on prolonged contact. This material may be absorbed through the skin resulting in systemic poisoning. Symptoms of poisoning are similar to those that occur with ingestion.
INHALATION may cause respiratory tract and mucous membrane irritation. Symptoms include nasal discharge and nosebleeds, coughing, sore throat and labored breathing. Severe exposure may cause bronchospasm and pulmonary edema. Absorption may cause systemic poisoning similar to that which occurs with ingestion.

INGESTION may cause abdominal pain, diarrhea, vomiting, excess salivation, thirst, perspiration and painful spasms of the limbs. Large amounts may be fatal.

CARCINOGENICITY

NTP? NO IARC? NO OSHA? NO

CHRONIC HEALTH HAZARDS

Exposure to FLUORIDES over years may produce mottling of tooth enamel, embrittlement and decalcification of bones, and increased calcification of ligaments and vertebrae resulting in spinal stiffness (fluorosis).

Prolonged absorption of BORON COMPOUNDS may cause mild gastrointestinal irritation, loss of appetite, nausea and erythematous rash. Dryness of the skin and mucous membranes, loss of hair, conjunctivitis and kidney injury have also been observed. Reproductive effects have been observed in laboratory animals.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

May aggravate existing respiratory and/or skin ailments.

NOTE: See Section VIII for Exposure Limits, Section XI for Toxicological Information and Section XII for Ecological Information.

EYE CONTACT: Immediately flush with plenty of water for at least 30 minutes. Do NOT use Zephiran Chloride solutions on eyes. Call a physician.

SKIN CONTACT: Immediately flush with cold water for at least 15 minutes while removing contaminated clothing and shoes, paying particular attention to skin under nails. Then immerse and soak contaminated area in 0.13% (1:750) iced, aqueous Zephiran Chloride solution for 30–60 minutes. Saturated compresses can be used if area cannot be immersed. Change compresses every two minutes. If irritation persists after initial Zephiran Chloride treatment, continue with Zephiran Chloride (BENZALKONIUM CHLORIDE) and call a physician.
INHALATION: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

INGESTION: If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Call a physician immediately. Never give anything by mouth to an unconscious person.

SECTION V: FIRE-FIGHTING MEASURES

Flash Point: Not Applicable
Auto-Ignition: Not Applicable
LEL: Not Applicable
UEL: Not Applicable

NFPA HAZARD CLASSIFICATION
Health: 3  Flammable: 0  Reactivity: 0

HMIS HAZARD CLASSIFICATION
Health: 3*  Flammable: 0  Reactivity: 0

* Indicates the possibility of chronic health effects. See Chronic Health Hazards in Section III for more information.

EXTINGUISHING MEDIA
Use water spray, dry chemical, alcohol foam, or carbon dioxide. Use water to keep fire-exposed containers cool.

SPECIAL FIRE FIGHTING PROCEDURES
Wear NIOSH/MSHA approved positive-pressure self-contained breathing apparatus and protective clothing as specified in 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Not a fire or explosion hazard. However, toxic and corrosive fluoride compounds may be released in a fire situation.

SECTION VI: ACCIDENTAL RELEASE MEASURES

Wearing full protective clothing, control spill source, contain by diking and ventilate area. Soak up spill using an absorbent. Scoop
into container. Notification of the National Response Center (800/424-8802) may be required. Refer to EPA, DOT and applicable state and local regulations for current response information.

It is recommended that each user establish a spill prevention, control and countermeasure plan (SPCC). Such plan should include procedures applicable to proper storage, control and clean-up of spills, including reuse or disposal as appropriate (see Section XI: Disposal Considerations).

**NOTE** In the event of an accidental release of this material, the above procedures should be followed. Additionally proper exposure controls and personal protection equipment should be used (see Section VIII - Exposure Control/Personal Protection) and disposal of the material should be in accordance with Section XI - Disposal Considerations.

**SECTION VII: HANDLING AND STORAGE**

Wash thoroughly after handling.
Keep container closed.
Store in a cool, dry location away from incompatible materials.

Avoid contact with any dusts, mists or fumes resulting from the use of this product.

Do not eat, drink, or smoke in work area.

Use with adequate ventilation.

**SECTION VIII: EXPOSURE CONTROLS/PERSONAL PROTECTION**

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>PEL-OSHA</th>
<th>TLV-ACGIH</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTASSIUM TETRABORATE</td>
<td>None Established</td>
<td>None Established</td>
</tr>
<tr>
<td>CAS NO.: 1332-77-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BORIC ACID</td>
<td>None Established</td>
<td>None Established</td>
</tr>
<tr>
<td>CAS NO.: 10043-35-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POTASSIUM PENTABORATE</td>
<td>None Established</td>
<td>None Established</td>
</tr>
<tr>
<td>CAS NO.: 11128-29-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POTASSIUM BIFLUORIDE</td>
<td>2.5 mg/m³ (as F)</td>
<td>2.5 mg/m³ (as F)</td>
</tr>
<tr>
<td>CAS NO.: 7789-29-9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SODIUM DODECYL SULFATE
CAS NO.: 151-21-3
None Established
None Established

WATER
CAS NO.: 7732-18-5
None Established
None Established

Unless otherwise noted, all values are reported as 8-hour Time-Weighted Averages (TWAs) and total dust (particulates only). All ACGIH TLVs refer to the 1992-93 Standards. All OSHA PELs refer to 29 CFR Part 1910 Air Contaminants: Final Rule, January 19, 1989.
NOTE: As a result of the July 7, 1992 decision by the U.S. Circuit Court of Appeals (AFL-CIO v. OSHA) to vacate the 1989 PELs, OSHA will no longer enforce these new limits and will return to the pre-1989 PELs. Engelhard, however, will continue to list the more protective 1989 levels.

RESPIRATORY PROTECTION

If there is a potential to exceed the TLV, NIOSH/MSHA approved respiratory protection is required. For airborne levels up to 10 times the appropriate TLV's, an air purifying acid gas cartridge respirator would be suitable. If used in a manner that generates a mist, a dust/mist cartridge as well as the acid gas cartridge would be necessary. Above 10 times the TLV, an air supplied full facepiece respirator would be required. If respiratory protection is used, follow all the requirements for respirator programs set forth in the OSHA regulations (29 CFR 1910.134).

VENTILATION

General: local exhaust ventilation as necessary to control any air contaminants to within their PELs or TLVs during the use of this product.

PROTECTIVE EQUIPMENT

Chemical goggles.
Rubber or neoprene gloves.
Body protection as necessary to prevent skin contact.
Refer to ANSI/ASC Z49.1-88 (Safety in Welding and Cutting) published by the American Welding Society for further information of the selection of personal protective equipment.

PERSONNEL SAMPLING PROCEDURE

SECTION IX: PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Not Applicable
Specific Gravity (H<sub>2</sub>O=1): 1.49
Melting Point: 422.4 °C
Vapor Pressure (mm Hg): Not Applicable
Vapor Density (Air=1): Not Applicable
Evaporation Rate (Butyl Acetate=1): Not Applicable
% Solubility In Water: 100 %
Appearance: White paste
Odor: Odorless
pH: Not Determined

SECTION X: STABILITY AND REACTIVITY

Stability: Generally considered stable.
Avoid: Temperatures at or above 225°C.

INCOMPATIBILITY (Materials to Avoid)
Strong acids and alkalies.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS

Emits toxic and corrosive fluoride compounds. May also emit oxides of boron and potassium when heated to decomposition.

Polymerization: Polymerization is not expected to occur.
Avoid: Not applicable.

SECTION XI: TOXICOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>% Wt. LD&lt;sub&gt;50&lt;/sub&gt;</th>
<th>LC&lt;sub&gt;50&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTASSIUM TETRABORATE</td>
<td>30-40</td>
<td>Not Available</td>
</tr>
<tr>
<td>CAS NO.: 1332-77-0</td>
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<td></td>
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<tr>
<td>BORIC ACID</td>
<td>20-30</td>
<td>9,600 ug/m³/4 hr</td>
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<tr>
<td>CAS NO.: 10043-35-3</td>
<td>3,450 mg/kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOUSE, oral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RAT</td>
<td></td>
</tr>
</tbody>
</table>
POTASSIUM PENTABORATE
CAS NO.: 11128-29-3
1-5 Not Available Not Available

POTASSIUM BIFLUORIDE
CAS NO.: 7789-29-9
20-30 Not Available Not Available

SODIUM DODECYL SULFATE
CAS NO.: 151-21-3
0-0.5 1,288 mg/m³ RAT, oral Not Available

WATER
CAS NO.: 7732-18-5
10-20 Not Available Not Available

NOTE: See Sections III, VIII and XII for additional information.

SECTION XIII: ECOLOGICAL INFORMATION

ECOTOXICITY
No data available.

ENVIRONMENTAL FATE
No data available.

SECTION XIII: DISPOSAL CONSIDERATIONS

US EPA Waste Number: D002

Federal, state and local disposal laws and regulations will determine the proper waste disposal/recycling/reclamation procedure. All waste material should be reviewed to determine the applicable hazards (testing may be necessary). Any waste solution with a pH of <=2 or >=12.5 is considered a hazardous waste under EPA hazardous waste regulations. Disposal requirements are dependent on the hazard classification and will vary by location and the type of disposal selected.

**NOTE** Chemical additions, processing or otherwise altering this material may make the waste management information presented above incomplete, inaccurate or otherwise inappropriate.

As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.
SECTION XIV: TRANSPORT INFORMATION

INTERNATIONAL
UN Number: UN1811

UNITED STATES
EPA Waste Number: D002
DOT Classification: 8 Corrosive material
DOT Proper Shipping Name: Potassium bifluoride, solution, Class 8, UN #1811, PG II (NOTE: Validated export license required for IC60C outside of COCOM countries. Consumer quantity, ORM-D, when purchased in < 1 liter/unit and not exceeding 66 lbs/box.)

Packing Group: II

CANADA
PIN Number: UN1811
TDG Class: 8 Corrosive material

EC
DGL: Corrosive substance

SECTION XV: REGULATORY INFORMATION

US FEDERAL REGULATIONS
TSCA: IN TSCA

SARA 311 AND 312 HAZARD CATEGORIES
IMMEDIATE (Acute) Health Hazard: YES
DELAYED (Chronic) Health Hazard: YES
FIRE Hazard: NO
REACTIVITY Hazard: NO
Sudden Release of PRESSURE: NO

SARA SECTION 313 NOTIFICATION
This product does not contain toxic chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.
OZONE DEPLETING SUBSTANCES (ODS)

This product neither contains nor is manufactured with an ozone depleting substance subject to the labeling requirements of the Clean Air Act Amendments 1990 and 40 CFR Part 82.

VOLATILE ORGANIC COMPOUNDS (VOC)

None

US STATE REGULATIONS

VOLATILE ORGANIC COMPOUND (CARB): Not Determined

CANADIAN REGULATIONS

DSL/NDSL: DSL

WHMIS Classification: Class D Division 2 Subdivision B
Class E

EUROPEAN REGULATIONS

EINECS: Yes

OTHER REGULATIONS

MITI: No

AICS: Yes

SECTION XVI: OTHER INFORMATION

REVISIONS
Revision Number: 3
This MSDS has been revised in the following section(s):
SECTION III: HAZARDS IDENTIFICATION

PREPARATION INFORMATION

Prepared By: Corporate Environment, Health & Safety Group
Phone Number: See Section I

The information in this Material Safety Data Sheet should be provided to all who will use, handle, store, transport, or otherwise be exposed to this product. This information has been prepared for the guidance of plant engineering, operations, and management and for persons working with or handling this product. The information presented in the MSDS is premised upon proper handling and anticipated uses and is for the
material without chemical additions/alterations. We believe this information to be reliable and up-to-date as of the date of publication, but make no warranty that it is. Additionally, if this Material Safety Data Sheet is more than three years old, please contact the supplier at the phone number listed in Section I to make certain that this sheet is current. Copyright Engelhard Corporation. License granted to make unlimited copies for internal use only. End of MSDS. . . . .