SECTION 1: IDENTIFICATION OF THE PRODUCT AND OF THE COMPANY

1.1 Product identifiers

Product Name : ACS Material Metal-Organic Framework Cu-BTC (HKUST-1)
Brand : ACS Material LLC
CAS-No. : 51937-85-0

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

Identified uses : Laboratory chemicals, Manufacturing of substances

1.3 Details of the supplier of the safety data sheet

Company : ACS MATERIAL LLC
959 E Walnut Street, 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

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Labelling according Regulation (EC) No 1272/2008 [CLP]

Pictogram

Signal word : Danger
Hazard statement(s)
H301 Toxic if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P353 IF ON SKIN (or hair): Wash with plenty of soap and water.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P362 Take off contaminated clothing and wash before reuse.
P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Substance name</th>
<th>CAS-No</th>
<th>EC-No.</th>
<th>Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal-Organic Framework Cu-BTC (HKUST-1)</td>
<td>51937-85-0</td>
<td>N/A</td>
<td>Copper benzene-1,3,5-tricarboxylate, Cu-BTC MOF, Cu₃(BTC)₂ (BTC = benzene-1,3,5-tricarboxylate)</td>
</tr>
<tr>
<td>Linear formula</td>
<td>C₁₈H₆Cu₃O₁₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molecular weight</td>
<td>604.87 g/mol</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hazardous ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>Concentration</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper benzene-1,3,5-tricarboxylate</td>
<td>≥ 99 %</td>
<td>51937-85-0</td>
</tr>
<tr>
<td>Benzene-1,3,5-tricarboxylic acid</td>
<td>&lt; 1 %</td>
<td>554-95-0</td>
</tr>
<tr>
<td>Copper(II) nitrate trihydrate</td>
<td>&lt; 1 %</td>
<td>10031-43-3</td>
</tr>
</tbody>
</table>

For the full text of the phrases mentioned in this Section, see Section 16.
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 breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. 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

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

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

SECTION 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. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling
Suitable extinguishing media
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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.

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
Contains no substances with occupational exposure limit values.

8.2 Exposure controls
Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

8.3 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 recommended. 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 N99 (US) or type P2 (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. Discharge into the environment must be avoided.

**SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES**

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

1) Appearance
   - Form: Solid
   - Colour: blue
2) Odour
   - No data available
3) Odour Threshold
   - No data available
4) pH
   - No data available
5) Melting point/freezing point
   - No data available
6) Initial boiling point and boiling range
   - No data available
7) Flash point
   - Not applicable
8) Evaporation rate
   - No data available
9) Flammability (solid, gas)
   - No data available
10) Upper/lower flammability or explosive limits
    - No data available
11) Vapour pressure
    - No data available
12) Vapour density
    - No data available
13) Relative density
    - No data available
14) Water solubility
    - Insoluble
15) Partition coefficient: n- octanol/water
    - No data available
16) Auto-ignition temperature
    - No data available
17) Decomposition temperature
    - No data available
18) Viscosity
    - No data available
19) Explosive properties
    - No data available
20) Oxidizing properties
    - No data available
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
   No data available

10.4 Conditions to avoid
   No data available

10.5 Incompatible materials
   Strong bases, Acids, Oxidizing agents, Alkali metals, Powdered metals, Strong oxidizing agents, Strong acids, Acid chlorides, Acid anhydrides, Reducing agents, Aldehydes, hydroxylamine, Aluminum, Strong reducing agents, Magnesium.

10.6 Hazardous decomposition products
   Hazardous decomposition products formed under fire conditions. - Carbon oxides, Sulphur oxides, Borane/boron oxides, Copper oxides.
   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
   No data available
   Inhalation: No data available
   Dermal: 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

**Specific target organ toxicity - single exposure**

No data available

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: No available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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**SECTION 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**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.
SECTION 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.

SECTION 14: TRANSPORT INFORMATION

14.1 UN number

ADR/RID: 2811  IMDG: 2811  IATA: 2811

14.2 UN proper shipping name

ADR/RID: Toxic solids, organic, n.o.s

IMDG: TOXIC SOLID, ORGANIC, N.O.S. (Copper benzene-1,3,5-tricarboxylate)

IATA: Toxic solid, organic, n.o.s. (Copper benzene-1,3,5-tricarboxylate)

14.3 Transport hazard class(es)

ADR/RID: 6.1  IMDG: 6.1  IATA: 6.1

14.4 Packaging group

ADR/RID: III  IMDG: III  IATA: III

14.5 Environmental hazards

ADR/RID: no  IMDG Marine pollutant: no  IATA: no

14.6 Special precaution for user

No data available

SECTION 15: REGULATORY INFORMATION

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

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

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

SARA 313/312 Hazards
Acute Health Hazard, Chronic Health Hazard
Pennsylvania Right To Know Components

<table>
<thead>
<tr>
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<th>Revision Date</th>
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<tbody>
<tr>
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<tr>
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New Jersey Right To Know Components

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<td></td>
</tr>
</tbody>
</table>

SECTION 16: OTHER INFORMATION

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

- Acute Toxicity: Acute toxicity
- Aquatic Acute: Acute aquatic toxicity
- Aquatic Chronic: Chronic aquatic toxicity
- Eye Dam.: Serious eye damage
- H301: Toxic if swallowed.
- H315: Causes skin irritation.
- H410: Very toxic to aquatic life with long lasting effects.
- Skin Corr.: Skin corrosion
- Skin Irrit.: Skin irritation
- STOT RE: Specific target organ toxicity - repeated exposure
- STOT SE: Specific target organ toxicity - single exposure

HMIS Rating
- Health hazard: 2

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

NFPA Rating
- Health hazard: 2
- 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.