



SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

| | |
|----------------|--|
| Product name | : Formamidinium lead iodide |
| Product number | : PY-P7102 |
| Synonyms | : FAPbI ₃ , Formamidinium triiodoplumbate |
| CAS No. | : 1451592-07-6 |

Manufacturer or supplier's details

Company name of supplier : PY Materials, LLC
Address : 2 Davis Drive, Durham, North Carolina 27709, USA.
Telephone : +1-919-454-4552
E-mail address : sales@pymaterials.com
Transportation Emergencies : Chemtrec 24-Hour +1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)

Recommended use of the chemical and restrictions on use

Recommended use : Use as laboratory reagent

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|--|--|
| Acute toxicity (Oral) | : Category 3 |
| Acute toxicity (Inhalation) | : Category 3 |
| Carcinogenicity | : Category 1B |
| Reproductive toxicity | : Category 1A |
| Specific target organ toxicity - single exposure | : Category 1 (Blood, Nervous system, Kidney) |
| Specific target organ toxicity - repeated exposure | : Category 1 (Blood, Nervous system, Kidney) |
| Specific target organ toxicity - repeated exposure | : Category 2 (Systemic toxicity) |
| Short-term (acute) aquatic hazard | : Category 1 |
| Long-term (chronic) aquatic hazard | : Category 1 |

GHS label elements



| | |
|-------------------|--|
| Hazard Statements | : H301 + H331 – Toxic if swallowed or if inhaled. H350 May cause cancer. H360 May damage fertility or the unborn child. H373-May cause damage to organs through prolonged or repeated exposure: Organs. H410 Very toxic to aquatic life with long lasting effects. |
|-------------------|--|

Precautionary Statements
: Prevention:

P201 Obtain special instructions before use.
 P202 Do not handle until all safety precautions have been read and understood.
 P260 Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
 P264 Wash skin thoroughly after handling.
 P270 Do not eat, drink or smoke when using this product.
 P271 Use only outdoors or in a well-ventilated area.
 P273 Avoid release to the environment.
 P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
 P304 + P340 + P311 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
 P307 + P311 IF exposed: Call a POISON CENTER or doctor/ physician.
 P391 Collect spillage.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Components

| Chemical name | CAS RN | Concentration (% w/w)* |
|---------------------------|--------------|------------------------|
| Formamidinium lead Iodide | 1451592-07-6 | >= 90 - <= 100 |

*Actual concentration is withheld as a trade secret

SECTION 4. FIRST AID MEASURES
If inhaled

If breathed in, move person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician.

In case of skin contact

Take off all contaminated clothing immediately. If on skin, rinse well with water. Call a POISON CENTER or doctor/ physician.

In case of eye contact

Rinse thoroughly with plenty of water. If easy to do, remove contact lens, if worn. Call a POISON CENTER or doctor/ physician.

If swallowed

Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.

Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2 or section 11)

SECTION 5. FIRE-FIGHTING MEASURES**Extinguishing media Suitable extinguishing media**

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Special hazards arising from the substance or mixture

Hydrogen iodide, lead oxides.

Ambient fire may liberate hazardous vapors.

Special protective equipment for fire-fighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

Further information

Suppress (knock down) gases/vapors/mists with a water spray jet.

Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES**Personal precautions, protective equipment and emergency procedures**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Avoid breathing dust. Ensure adequate ventilation.

Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

Environmental precautions

Should not be released into the environment.

Methods and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Cover drains. Sweep up and shovel. Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE**Precautions for safe handling**

Avoid contact with skin, eyes and clothing. Wear personal protective equipment. Wash hands and face thoroughly after handling.

Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

Use only under a chemical fume hood.

Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Normal measures for preventive fire protection.

For precautions see section 2.

Conditions for safe storage, including any incompatibilities

Keep container tightly closed. Light sensitive. Store in a cool and shaded area. Protect from moisture. Keep under inert gas. Keep locked up or in an area accessible only to authorized persons.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

| Chemical name | CAS RN | Value type (Form of exposure) | Control parameters / Permissible concentration | Basis |
|---------------------------|--------------|-------------------------------|--|-----------|
| Formamidinium lead Iodide | 1451592-07-6 | PEL | 0.05 mg/m3 (Lead) | OSHA CARC |
| | | TWA | 0.05 mg/m3 (Lead) | NIOSH REL |
| | | TWA | 0.05 mg/m3 (Lead) | ACGIH |

The value is given in analogy to the following substances: Lead(II) iodide

Biological occupational exposure limits

| Chemical name | CAS RN | Control parameters | Biological specimen | Sampling time | Permissible concentration | Basis |
|---------------------------|--------------|--------------------|---------------------|---------------|---------------------------|-----------|
| Formamidinium lead Iodide | 1451592-07-6 | Lead (Lead) | In blood | Not critical | 200 µg/l | ACGIH BEI |

The value is given in analogy to the following substances: Lead(II) iodide

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Respiratory protection : Dustproof gas mask, Self-contained breathing apparatus
 Hand protection : Impervious gloves
 Eye protection : Safety glasses, Face-shield
 Skin and body protection : Impervious protective clothing

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Solid form (powder/crystals)
 Color : Black
 Odor : no data available

| | |
|---------------------------|---------------------|
| Odor Threshold | : no data available |
| pH | : no data available |
| Melting point | : no data available |
| Boiling point/range | : no data available |
| Flash point | : no data available |
| Evaporation rate | : no data available |
| Flammability | : no data available |
| Upper/lower flammability | : no data available |
| Explosive limits | : no data available |
| Vapor pressure | : no data available |
| Vapor density | : no data available |
| Relative density | : no data available |
| Solubility(ies) | : no data available |
| Partition coefficient | : no data available |
| Auto-ignition temperature | : no data available |
| Decomposition Temp | : no data available |
| log Pow | : no data available |
| Viscosity | : no data available |
| Oxidizing properties | : no data available |
| Molecular weight | : 632.98 g/mol |

SECTION 10. STABILITY AND REACTIVITY

| | |
|------------------------------------|---|
| Reactivity | : No data available |
| Chemical stability | : No data available |
| Possibility of hazardous reactions | : No data available |
| Conditions to avoid | : Exposure to light. Exposure to moisture. |
| Incompatible materials | : Oxidizing agents |
| Hazardous decomposition products | : Hydrogen halides, Metal oxides, Carbon monoxide, Carbon dioxide (CO ₂), Nitrogen oxides (NO _x). |

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

| | |
|------------|---------------------|
| Oral | : 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 sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: Group 2A: Probably carcinogenic to humans (Formamidinium lead iodide).

NTP: Reasonably anticipated to be a human carcinogen (Formamidinium lead iodide).

OSHA: OSHA specifically regulated carcinogen (Formamidinium lead iodide).

Reproductive toxicity

May cause congenital malformation in the fetus.

Known human reproductive toxicant.

Specific target organ toxicity - single exposure

Target Organs : Blood, Nervous system, Kidney

Assessment : Causes damage to organs.

Specific target organ toxicity - repeated exposure

Target Organs : Blood, Nervous system, Kidney

Assessment : Causes damage to organs through prolonged or repeated exposure

Target Organs : Systemic toxicity

Assessment : May cause damage to organs through prolonged or repeated exposure

Aspiration hazard

No data available

Additional Information

Anemia, prolonged exposure to iodides may produce iodism in sensitive individuals. Symptoms of exposure include: skin rash, running nose, headache and irritation of the mucous membrane. For severe cases the skin may show pimples, boils, hives, blisters and black and blue spots. Iodides are readily diffused across the placenta. Neonatal deaths from respiratory distress secondary to goiter have been reported. Iodides have been known to cause drug-induced fevers, which are usually of short duration. Lead salts have been reported to cross the placenta and to induce embryo- and feto- mortality. They also have teratogenic effect in some animal species. No teratogenic effects have been reported with exposure to organometallic lead compounds. Adverse effects of lead on human reproduction, embryonic and fetal development, and postnatal (e.g., mental) development have been reported. Excessive exposure can affect blood, nervous, and digestive systems. The synthesis of hemoglobin is inhibited and results in anemia. If left untreated, neuromuscular dysfunction, possible paralysis, and encephalopathy can result. Additional symptoms of overexposure include: joint and muscle pain, weakness of the extensor muscles (frequently the hand and wrist), headache, dizziness, abdominal pain, diarrhea, constipation, nausea, vomiting, blue line on the gums, insomnia, and metallic taste. High body levels produce increased cerebrospinal pressure, brain damage, and stupor leading to coma and often death.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Acute aquatic toxicity : Very toxic to aquatic life.

Chronic aquatic toxicity : Very toxic to aquatic life with long lasting effects.

Persistence and degradability

No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential : Regulation: 40 CFR Protection of Environment; Part 82
Protection of Stratospheric Ozone - CAA Section 602
Class I Substances
Remarks: This product neither contains, nor was
manufactured with a Class I or Class II ODS as defined by
the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A,
App.A + B).

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Waste material must be disposed of in accordance with the national
and local regulations. Leave chemicals in original containers. No
mixing with other waste. Handle uncleaned containers like the product
itself. Before disposal of used container, remove contents completely.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No. : UN 2291
Proper shipping name : Lead compound, soluble, n.o.s.
Class : 6.1
Packing group : III

IMDG-Code

UN number : UN 2291
Proper shipping name : LEAD COMPOUND, SOLUBLE, N.O.S.
Class : 6.1
Packing group : III
EmS Code : F-A, S-A
Marine pollutant : yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

Domestic regulation

49 CFR

UN/ID/NA number : UN 2291
 Proper shipping name : Lead compounds, soluble, n.o.s.
 Class : 6.1
 Packing group : III
 ERG Code : 151
 Marine pollutant : yes

Special precautions for user

The transport classification(s) provided herein are for informational purposes only and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

| Components | CAS RN | Component RQ (lbs) | Calculated product RQ (lbs) |
|---------------------------|--------------|--------------------|-----------------------------|
| Formamidinium lead iodide | 1451592-07-6 | 10 | 10 |

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard
 Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Formamidinium lead iodide 1451592-07-6 >= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

Formamidinium lead iodide 1451592-07-6 >= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCM Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

The following Hazardous Substances are listed under the U.S. Clean Water Act, Section 311, Table 116.4A:

Formamidinium lead Iodide 1451592-07-6 >= 90 - <= 100 %

The following Hazardous Substances are listed under the U.S. Clean Water Act, Section 311, Table 117.3:

Formamidinium lead Iodide 1451592-07-6 >= 90 - <= 100 %

The following Hazardous Substances are listed under the U.S. Clean Water Act Section 307. This product does not contain any priority pollutants related to the U.S. Clean Water Act:

Formamidinium lead Iodide 1451592-07-6 >= 90 - <= 100 %

US State Regulations

Massachusetts Right to Know

Product does not contain any listed chemicals

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

California Prop. 65 Components

WARNING: This product can expose you to chemicals including Formamidinium lead Iodide (lead compound), which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

California List of Hazardous Substances

Formamidinium lead Iodide (lead compound) 1451592-07-6

California Permissible Exposure Limits for Chemical Contaminants

Formamidinium lead Iodide (lead compound) 1451592-07-6

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

The information was prepared sincerely based on the information obtained and is believed to be correct but is not exhaustive and will be used solely as a guideline. It does not represent any guarantee of the properties of the product. The products must be handled only by those who are

familiar with specialized knowledge and have experience or under the guidance of those specialists throughout use from opening to storage and disposal. Safe usage conditions shall be set up on each user's own responsibility. PY Materials, LLC shall not be held liable for any damage resulting from handling or from contact with the above product.