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-----ISO 9001: 2015-----

MATERIAL SAFETY DATA SHEET

1. Identification

1.1 GHS Product identifier

Fluorene, 98%

Code F 1410

2. Hazard identification

2.1 Classification of the substance or mixture

Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Hazard statement(s)

Precautionary statement(s)

Prevention

Response

Storage

Disposal

2.3 Other hazards which do not result in classification

none

Warning

H400 Very toxic to aquatic life

P273 Avoid release to the environment.

P391 Collect spillage.

none

P501 Dispose of contents/container to ...

3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
fluorene	fluorene	86-73-7	none	100%

4. First-aid measures

4.1 Description of necessary first-aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

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/effects, acute and delayed

ACUTE/CHRONIC HAZARDS: Fire hazards: Slight, when exposed to heat or flame.

4.3 Indication of immediate medical attention and special treatment needed, if necessary

/SRP:/ Immediate First Aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Aromatic hydrocarbons and related compounds/

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Specific hazards arising from the chemical

no data available

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. 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

ACCIDENTAL RELEASE MEASURES: Personal precautions, protective equipment and emergency procedures: Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. 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. 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.

7. Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use. 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. Storage class (TRGS 510): Non Combustible Solids.

8. Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 0.1 mg/cu m (cyclohexane-extractable fraction). /Coal tar pitch volatiles/ NIOSH considers coal tar pitch volatiles to be potential occupational carcinogens. NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. /Coal tar pitch volatiles/

Biological limit values

no data available

8.2 Appropriate engineering controls

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

8.3 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. 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. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9. Physical and chemical properties

Physical state

white flakes

Colour

Leaflets from alcohol

Odour

no data available

Melting point/ freezing point

207\°C(lit.)

Boiling point or initial boiling point and boiling range

193\°C(lit.)

Flammability

no data available

Lower and upper explosion limit / flammability limit

no data available

Flash point

76\°C(lit.)

Auto-ignition temperature

no data available

Decomposition temperature

no data available

pH

no data available

Kinematic viscosity

no data available

Solubility

In water:insoluble

Partition coefficient n-octanol/water (log value)

log Kow = 4.18

Vapour pressure

10 mm Hg at 146\°C

Density and/or relative density

1.203

Relative vapour density

no data available

Particle characteristics

no data available

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

This compound is not very flammable but any fire involving this compound may produce dangerous vapors. Vigorous reactions, sometimes amounting to explosions, can result from the contact between aromatic hydrocarbons, such as FLUORENE, and strong oxidizing agents. They can react exothermically with bases and with diazo compounds. Substitution at the benzene nucleus occurs by halogenation (acid catalyst), nitration, sulfonation, and the Friedel-Crafts reaction.

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

Incompatible materials: Strong oxidizing agents.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions - Carbon oxides.

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/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

No data are available in humans. Inadequate evidence of carcinogenicity in animals. OVERALL EVALUATION: Group 3: The agent is not classifiable as to its carcinogenicity to humans.

Reproductive toxicity

no data available

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12. Ecological information

12.1 Toxicity

Toxicity to fish: LC50; Species: *Lepomis macrochirus* (Bluegill) weight 0.8 g; Conditions: freshwater, static, 22°C, pH 7.5, hardness 280 mg/L CaCO₃; Concentration: 760 µg/L for 96 hr (95% confidence interval: 590-970 µg/L) /98% purity

Toxicity to daphnia and other aquatic invertebrates: EC50; Species: *Daphnia magna* (Water Flea) 1st instar larva; Conditions: freshwater, static, 17°C, pH 7.5, hardness 280 mg/L CaCO₃; Concentration: 430 µg/L for 48 hr (95% confidence interval: 330-550 µg/L); Effect: intoxication, immobilization /98% purity

Toxicity to algae: EC50; Species: *Pseudokirchneriella subcapitata* (Green Algae); Conditions: freshwater, static; Concentration: 3400 µg/L for 96 hr; Effect: general population changes, decreased population /98.6% purity

Toxicity to microorganisms: no data available

12.2 Persistence and degradability

AEROBIC: In microbial degradation studies conducted in sandy material, fluorene and other polyaromatic hydrocarbons degraded to an average of 80% (1); in sterile controls, fluorene did not degrade suggesting microbial activity as the route of degradation (1). A review of environmental fate for fluorene has reported a fluorene biotransformation rate constant of 0.0062-0.01/hr (2); this corresponds to a half-life of 2.9-4.6 days (SRC). In a 7 day static incubation study using a sewage seed (followed by three weekly subculture inoculations for a total of 28 days of incubation), 65-82% of initial fluorene (5 and 10 ppm) was degraded after 7 days and 45-77% (of total additions) was degraded after 28 days (3); fluorene was classified as significantly degraded with gradual microbial adaptation (3). In biodegradation screening studies using subsurface soil from a contaminated creosote site, >92% of initial fluorene degraded within 1 week of incubation (4); in autoclaved soil, the degradation rate fell to 3.4% per week (4); using soil from a pristine site, the degradation rate was not statistically different between autoclaved and non-autoclaved soil suggesting that microbial adaptation to fluorene is important in subsurface regions (4).

12.3 Bioaccumulative potential

A log BCF of 3.17 (1479) was measured in the fathead minnow (*Pimephales promelas*) which were exposed over 28 days in a flow-through system (1). Log BCFs of 3.02-3.35 (1047-2238) were measured in guppies (*Poecilia reticulata*) exposed in 2-4 day periods under static and semi-static test conditions (2). A log BCF of 3.15 (1412) was measured in mosquitofish (*Gambusia affinis*) exposed over a 33 day exposure using an aquatic ecosystem (3). According to a classification scheme (4), these BCF values suggest the potential for bioconcentration in aquatic organisms is very high (SRC), provided the compound is not metabolized by the organism (SRC). Bioconcentration studies on compounds which are structurally similar suggest that bioconcentration may be lower than that indicated by the regression-derived equations due to the ability of aquatic organisms to readily metabolize this class of compounds (5).

12.4 Mobility in soil

Log Koc values of 3.70 to 4.21 (5011 to 16,218) have been measured for fluorene using aquifer materials and humic materials occurring in natural water and soil(1-3). According to a classification scheme(4), these Koc values suggest that fluorene is expected to be immobile in soil. Log Koc values of 6.52 and 6.45 were reported using sediment from Lake Ketelmeer, The Netherlands(5). In an adsorption study using an estuarine water, 12% of added fluorene was adsorbed by particulate matter in water (organic matter, bacteria, clay particles, etc) over a 3-hour period which indicates that adsorption in natural estuarine water is an important environmental fate process(6).

12.5 Other adverse effects

no data available

13. Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14. Transport information

14.1 UN Number

ADR/RID: UN3077

IMDG: UN3077

IATA: UN3077

14.2 UN Proper Shipping Name

ADR/RID: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

IMDG: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

IATA: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

14.3 Transport hazard class(es)

ADR/RID: 9

IMDG: 9

IATA: 9

14.4 Packing group, if applicable

ADR/RID: III

IMDG: III

IATA: III

14.5 Environmental hazards

ADR/RID: yes

IMDG: yes

IATA: yes

14.6 Special precautions for user

no data available

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

no data available

15. Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
fluorene	fluorene	86-73-7	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Not Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.

Section 16: Other Information

This safety data sheet should be used in conjunction with technical sheets. It does not replace them. The information given is based on our knowledge of this product, at the time of publication. It is given in good faith. The attention of the user is drawn to the possible risks incurred by using the product for any other purpose other than that for which it was intended. This does not in any way excuse the user from knowing and applying all the regulations governing his activity. It is the sole responsibility of the user to take all precautions required in handling the product. The aim of the mandatory regulations mentioned is to help the user to fulfill his obligations regarding the use of hazardous products.