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School Materials Safety Manual:

No. 136 Ferrous Sulfate Heptahydrate
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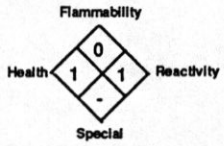
♦SECTION 1 INTRODUCTION

Material Ferrous Sulfate Heptahydrate, ca 100%
Synonyms copperas, Feosol, Fer-in-Sol, Fero-Gradumet, Fesofor, Fesotyme, green vitriol, Haemofort, Ironate, iron (II) sulfate heptahydrate, iron vitriol, Mol-Iron, Presfersul, Sulferrous
Chemical Formula $FeSO_4 \cdot 7H_2O$
CAS Number 7782-63-0
DOT Classification *Not* listed as a Hazardous Material for Transportation (49 CFR 172.101)
EPA Classification Listed as a CERCLA Hazardous Substance (40 CFR 302.4). *Not* listed as a RCRA Hazardous Waste (40 CFR 261.33), a SARA Extremely Hazardous Substance (40 CFR 355), or a SARA Toxic Chemical (40 CFR 372.65)
OSHA Classification Listed as (iron salts, as Fe) an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)
NFPA Hazard Rating Not found

Genium Hazard Rating
4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Minimum



HMIS
H 1
F 0
R 1

Description Odorless, blue-green monoclinic crystals or granules. Derived by action of dilute sulfuric acid and iron. Loses water on heating at or above 134 °F (56.6 °C) to form the tetrahydrate; the monohydrate forms at 149 °F (65 °C) and an anhydrous salt at 572 °F (300 °C) which decomposes at higher temperatures to give sulfur oxides (SO_x).
Overview Ferrous sulfate heptahydrate is a stable noncombustible material that is irritating to the eyes, skin, and respiratory tract. Chronic or excessive ingestion can have severe health effects (Sec. 4). The most common area of use in the school environment is the chemistry lab. Also used in manufacturing iron, iron compounds, and other sulfates; in etching aluminum; in electroplating baths; in writing ink, process engraving, lithography, radiation dosimeters, pesticides, and fertilizer; as a feed and food supplement, a polymerization catalyst, a reducing agent in chemical processes, a wood preservative, a weed killer, and a dye for leather.
Manufacturer Always request an up-to-date MSDS from your chemical supplier. That sheet should include the manufacturer and their emergency phone numbers. This *Manual*'s Resources/Manufacturers Index lists some larger manufacturers and available emergency phone numbers.

♦SECTION 2 USE AND STORAGE DATA

Preliminary Planning Considerations *Plan and provide for safe disposal of all school-generated chemical waste.* Check applicable regulations prior to use. Provide adequate dilution or local exhaust ventilation or restrict use to fume hood to avoid exceeding the TLV (Sec. 4). Contact lens use when handling chemical materials is controversial. In some cases, soft lenses can actually protect eyes from chemicals. In other cases, chemical entrapment is presumed a possible hazard. Particles adhering to contact lens surfaces can cause corneal damage. For safety, always wear safety glasses or goggles. Wear rubber gloves to minimize skin contact. Employees and students should know the location of eyewash and shower facilities near chemical use areas. Keep the area around the eyewash and shower facilities clear. Routinely check that eyewash stations and safety showers are working properly.
Usage Precautions and Procedure Before using, *read this material's container label* and follow all precautions. Do not smoke in usage or storage areas. Practice good housekeeping to avoid unintentionally mixing incompatibles. Do not allow chemical residue or dust buildup in lab or work areas. Wear safety glasses or goggles and appropriate protective clothing to work with ferrous sulfate heptahydrate. Keep this material away from notebooks, textbooks, and personal belongings to avoid transporting chemical residues from the lab/work area. After working with chemical materials, and before eating, drinking, or smoking, always wash hands and face. Remove and launder contaminated clothing before reusing.
Additional Data Ferrous sulfate heptahydrate is stable at room temperature under normal handling and storage conditions. It slowly oxidizes in air, forming yellow brown-colored, corrosive, basic ferric sulfate. It does not polymerize. Its incompatibilities include alkalis, soluble carbonates, oxidizing agents, gold and silver salts, lead acetate, lime water, potassium iodide, potassium, sodium tartate, sodium borate, and tannin.
Preferred Storage Location and Methods Store in tightly closed containers in cool, well-ventilated area out of direct sunlight and away from incompatibles. To separate incompatible chemicals, store by chemical family, not by alphabetical name. Protect all chemical containers from physical damage. Prohibit smoking in chemical storage areas. Purchase amounts sufficient for one year's use or less.

♦SECTION 3 SPILL/DISPOSAL PROCEDURES

If Spilled Ventilate spill area. Promptly and thoroughly clean up spilled material. Cleanup personnel should protect against dust inhalation and skin or eye contact. Avoid generating dusty conditions. For liquid (solution) spills, cover with an inert solid absorbent (vermiculite, dry sand, etc.) and scoop into appropriate containers (with secure lid) for disposal in accordance with existing regulations. As needed, dike spill area with inert absorbent material to contain spill. For dry spills, carefully collect spilled material and scoop into secure disposal or reclamation containers.
Disposal of Small Quantities *Handle emptied containers carefully since residues may remain.* Always check regulations before disposal. Investigate recycling or reclamation rather than landfill disposal. Treat ferrous sulfate heptahydrate solutions with soda ash or dilute sodium hydroxide (NaOH) to precipitate iron. If these methods are not practical, feasible, or in accord with existing regulations, contact your supplier or a licensed disposal contractor for specific treatment/disposal procedures.
Disposal of Larger Amounts Contact your supplier or a licensed disposal company.

Follow all applicable local, state, and Federal regulations for all waste disposal.

♦SECTION 4 HEALTH HAZARDS

Dust or mist inhalation is irritating to the respiratory tract. Eye contact is irritating and can be damaging. Skin contact is irritating, especially if repeated or prolonged. Although ferrous sulfate heptahydrate is used as a nutrient and/or dietary supplement in food as well as a trace mineral added to animal feed, ingestion of significant amounts can cause gastrointestinal (GI) disturbances.

1991-92 ACGIH TLV 8-hr TWA: 1 mg/m^3 (iron salts ,soluble, as Fe)
1990 NIOSH REL 10-hr TWA: 1 mg/m^3 (iron salts, soluble, as Fe)
1990 OSHA PEL 8-hr TWA: 1 mg/m^3 (iron salts, soluble, as Fe)
1985-6 Toxicity Data Mouse, oral, LD_{50}: 1520 mg/kg; Rat, oral, LD_{Lo}: 1389 mg/kg; Rabbit, oral, LD_{Lo}: 2778 mg/kg
Carcinogenicity Not listed by the IARC, NTP, or OSHA
Acute Effects Ingestion of large amounts of ferrous sulfate heptahydrate produces gastrointestinal disturbances including gastric distress, colic, constipation, and diarrhea. In children, ingestion of large quantities may cause vomiting (possibly bloody), hepatic (liver) damage, tachycardia (rapid heart beat), and peripheral vascular collapse.
Chronic Effects Chronic ingestion causes increased iron accumulation in the body, especially in the liver, spleen, and lymphatic system. Chronic iron dust inhalation may cause a mottling appearance of chest x-rays; this is considered a benign pneumoconiosis based upon the non-normal lung x-ray. The iron deposition in the lung is of uncertain significance to health.

♦SECTION 5 FIRST AID PROCEDURES

Eye Contact Promptly flush eyes with plenty of running water for at least 15 min, including under eyelids. Get prompt medical attention.
Skin Contact *Quickly* remove contaminated clothing. After flushing with large amounts of water, wash exposed areas with soap and water. If irritation or pain persist, get prompt medical attention.
Inhalation Remove victim from exposure to fresh air and support breathing as necessary.
Ingestion Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious and alert person drink 1 to 2 glasses of water and induce vomiting. Get *prompt* medical attention.

Get proper in-school, paramedic, or community medical attention and support.

♦SECTION 6 FIRE PROCEDURES AND DATA

Fire Hazards For major fires, or for fires involving large quantities, firefighters should wear appropriate protective clothing and respirators. Because fire may produce toxic thermal decomposition products, a self-contained breathing apparatus (SCBA) is recommended.
Flash Point and Method Noncombustible
Autoignition Temperature None reported
Flammability Limits in Air (vol. %) None reported
Hazardous Decomposition Products Thermal oxidative decomposition of ferrous sulfate heptahydrate can produce toxic sulfur oxides (SO_x).
Extinguishing Media For small fires, use dry chemical, carbon dioxide (CO_2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. Use water spray to cool fire-exposed containers. *Do not scatter* spilled material with high-pressure water stream.

♦SECTION 7 PHYSICAL DATA

Melting Point 147 °F (64 °C), loses $7H_2O$ by 572 °F (300 °C)
Solubility in Water 16 g/100 g cold water; 48.6 g/100 g hot water, 122 °F (50 °C)
Insolubility Alcohol
pH of 10% Aqueous Solution 3.7
Molecular Weight 278.05
Specific Gravity (H_2O = 1) 1.89

References 73, 103, 124, 126, 127, 132, 136, 152, 162, 163, 527; Genium's *Material Safety Data Sheets Collection*, No. 57 (7/91)
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