

# ferric sulfate

Review Date: 5/19/2009

|                |                                     |
|----------------|-------------------------------------|
| Type           | Contact herbicide for moss control. |
| Controls       | Moss                                |
| Mode of Action | Contact herbicide.                  |

## Thurston County Review Summary:

Because iron compounds are so abundant in the environment (food and soil) and have such low toxicity hazard, the EPA waived most of the required data sets for product registration. So, even though the review criteria is incomplete, ferric sulfate and other iron salts are considered low in environmental and toxicity hazards.

## MOBILITY

| Property                    | Value     | Reference | Rating |
|-----------------------------|-----------|-----------|--------|
| Solubility (mg/L)           | 550,000   | 2         | High   |
| Soil Sorption (Kd=mL/g)     | Not found |           |        |
| Organic Sorption (Koc=mL/g) | Not found |           |        |

### Mobility Summary:

Ferric sulfate is very soluble in water and is expected to quickly convert to ferric oxide in normal environmental conditions. Ferric oxide strongly binds to organic material. The EPA made the following statement about ferric sulfate and the risk of mobility; "Runoff to aquatic systems is unlikely since the parent compounds convert very rapidly to less soluble forms in the environment. Furthermore, the oxidized iron compounds bind tightly to soil under turf." (Reference 1) Mobility of ferric sulfate is considered low in hazard.

## PERSISTENCE

| Property                                | Value     | Reference | Rating |
|---|-----------|-----------|--------|
| Vapor Pressure (mm Hg)                  | Not found |           |        |
| Biotic or Aerobic Half-life (days)      | Not found |           |        |
| Abiotic Half-life (days)                | Not found |           |        |
| Terrestrial Field Test Half-life (days) | Not found |           |        |
| Hydrolysis Half-life (days)             | Not found |           |        |
| Anaerobic Half-life (days)              | Not found |           |        |
| Aquatic Field Test Half-life (days)     | Not found |           |        |

### Persistence Summary:

Ferric sulfate is expected to produce iron oxides and hydroxides that are no different from those normally found in soils, and which give soils their brown and red colors. Ferric sulfate and its breakdown chemicals are considered persistent but have not been identified as a concern for groundwater contamination.

## BIOACCUMULATION

| Property                            | Value     | Reference | Rating |
|-------------------------------------|-----------|-----------|--------|
| Bioaccumulation Factor              | Not found |           |        |
| Bioconcentration Factor             | Not found |           |        |
| Octanol/Water Partition Coefficient | Not found |           |        |

### Bioaccumulation Summary:

No bioaccumulation data could be found because iron compounds are so naturally abundant in soil and food, and because their toxicity is considered low, that the bioaccumulation data that the EPA normally requires has been waived.

# ACUTE TOXICITY

| Test Subject               | Value        | Reference | Rating   |
|----------------------------|--------------|-----------|----------|
| Mammalian (LD50)           | 1,487 mg/kg  | 1         | Moderate |
| Avian (LD50)               | >2,510 mg/kg | 1         | Low      |
| Honey bee or insect (LD50) | Not found    |           |          |
| Annelida -worms (LC50)     | Not found    |           |          |
| Fish (LC50)                | >20.8 ppm    | 1         | Moderate |
| Crustacean (LC50)          | >7.1 ppm     | 1         | Moderate |
| Mollusk (LC50)             | Not found    |           |          |
| Amphibian (LD50 or LC50)   | Not found    |           |          |

## Acute Toxicity Summary:

Single-dose toxicity testing indicates that ferric sulfate is low in toxicity to birds and moderately toxic to mammals, fish, and other aquatic organisms. Because iron compounds are so naturally abundant in soil and food, most of the EPA required data is unavailable because it was not considered needful for the toxicological evaluation.

Ferric sulfate is considered low in acute toxicity hazard, however, it is corrosive and can cause injury to eyes and skin.

# ACUTE TOXICITY - Risk Assessment

| Subject and Scenario                        | Dose of Concern | Exposure | Margin of Safety | Route | Reference | Rating |
|---|-----------------|----------|------------------|-------|-----------|--------|
| Exposures to applicators were waived        |                 |          |                  |       |           |        |
| Exposures to treated vegetation were waived |                 |          |                  |       |           |        |
| Dietary exposure assessments were waived    |                 |          |                  |       |           |        |
| Combined exposure assessments were waived   |                 |          |                  |       |           |        |

## Acute Toxicity Risk Assessment Summary

"The human risks from both dietary and occupational exposures are considered negligible. The general knowledge of iron (III) sulfate and iron (II) sulfate hepta- and monohydrate indicate low toxicities associated with these compounds. They are used by humans as food flavoring agents and food nutrient supplements, and have inherent function in the metabolic pathways of humans and domestic animals. No additional hazard or exposure data are required for reregistration eligibility." (Reference 1).

The risk of toxicity from short-term exposures to ferric sulfate products is considered to be low in hazard.

# CHRONIC TOXICITY

| Property                       | Value                             | Adverse Effect               | Reference | Rating |
|--------------------------------|-----------------------------------|------------------------------|-----------|--------|
| Carcinogenicity                | Not listed by IARC                | Not considered a carcinogen  | 4         | Low    |
| Mutagenicity                   | 30 umol/L                         | Positive mutation in E. coli | 1         | Low*   |
| Neurotoxicity - (NOAEL)        | Not identified as a neurotoxicant | --                           | 4         | Low    |
| Endocrine Disruption           | Not found                         |                              |           |        |
| Developmental Toxicity (NOAEL) | No known developmental toxicity   | --                           | 4         | Low    |
| Reproductive Toxicity (NOAEL)  | No known reproductive toxicity    | --                           | 4         | Low    |
| Chronic Toxicity (NOAEL)       | Waived                            | --                           | 1         | Low    |

## Chronic Toxicity Summary:

\* "Although a mutagenicity study using microorganisms showed positive results, it is unlikely that such effects would result in humans or other mammals at the levels of exposure expected from the use of iron salts as pesticides." (Reference 1). Ferric sulfate is not listed by ACGIH, IARC, NIOSH, NTP, or OSHA as carcinogen (Reference 3), it is not an identified neurotoxicant, and it is not on California's Proposition 65 list of reproductive or developmental toxicants (Reference 4).

Ferric sulfate is considered low in chronic toxicity hazard.

# CHRONIC TOXICITY - Risk Assessment

| Subject and Scenario                              | Dose of Concern | Exposure | Margin of Safety | Route | Reference | Rating |
|---|-----------------|----------|------------------|-------|-----------|--------|
| Contacting treated vegetation exposure was waived |                 |          |                  |       |           |        |
| Combined exposures were waived                    |                 |          |                  |       |           |        |
| Drinking water exposure assessments were waived   |                 |          |                  |       |           |        |
| Dietary exposure assessments were waived          |                 |          |                  |       |           |        |

## Chronic Toxicity Risk Assessment Summary:

The EPA waived the requirement for a chronic risk assessment for the potential exposures to ferric sulfate from herbicidal use. "The human risks from both dietary and occupational exposures are considered to be negligible." (Reference 1)

The risk for toxicity from long-term exposures to ferric sulfate from herbicide products is considered to be low in hazard.

## Degradation Products:

Iron [Fe (II) or Fe (III)] sulfates when applied to land leads to the formation of insoluble oxide/oxyhydroxide species (Reference 1).

## Comments:

Ferric sulfate is considered corrosive to the eyes and skin, but is not considered a skin sensitizer (Reference 1).

## References

- USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Document (RED); Iron Salts. EPA-738-93-002. February 1993.
- Science Stuff, Inc. Material Data Safety Sheet. Product Number: C1747. Product Name: Ferric Sulfate, Hydrate Reagent Grade. 9/1/2006.
- Fisher Scientific. MSDS Name: Ferric Sulfate Monohydrate. Catalog Number: S80013. Creation Date: 12/12/1997 Revision #1 Date: 8/02/2000.
- Toxics Use Reduction Institute, University of Massachusetts Lowell. Policy Analysis: Recommendation to take no action on certain CERCLA chemicals that have been reported by TURA filers.