ferrous 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, ferrous sulfate and other iron salts are considered low in environmental and toxicity hazards and passes Thurston County's review criteria.

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:

Ferrous sulfate is very soluble in water and is expected to quickly convert to ferrous oxide in normal environmental conditions. Ferrous oxide strongly binds to organic material. The EPA made the following statement about ferrous 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 ferrous 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:

Ferrous 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. Ferrous 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 ferrous 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.

Ferrous 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 ferrous 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)	Not identified as a developmental toxicant	- -	4	Low
Reproductive Toxicity (NOAEL)	Not identified as a reproductive toxicant	- -	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). Ferrous 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).

Ferrous 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 ferrous 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 ferrous sulfate from herbicide products is considered to be low in hazard.

DegradationProducts:

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

Comments:

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

References

1. USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Document (RED); Iron Salts. EPA-738-93-002. February 1993.
2. Science Stuff, Inc. Material Data Safety Sheet. Product Number: C1747. Product Name: Ferric Sulfate, Hydrate Reagent Grade. 9/1/2006.
3. Fisher Scientific. MSDS Name: Ferric Sulfate Monohydrate. Catalog Number: S80013. Creation Date: 12/12/1997 Revision #1 Date: 8/02/2000.
4. 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.