Safety Data Sheet

According to: The Regulations for Hazardous Chemical Agents, 2021 and Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev. 9.

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Agricultural division: Growing with FERTION ANIMADE

SECTION 1: Identification of the substance / mixture and of the supplier

1.1 Product identifiers

Product (trade) name	: Ferrous Sulphate Monohydrate
Act No. 36 of 1947 Registration number	: B4229 (Fertilizer) / V24100 (Feed)
Grade	: Fertilizer / Feed
Product range	: Fertion (Fertilizer) / Animade (Feed)
Synonyms	: Iron (II) sulphate hydrate; Iron ($^{2+}$) sulphate monohydrate.

1.2 Relevant identified uses of the substance or mixture and restrictions on use

Relevant identified uses

Used as an additive in the manufacturing of animal feeds, fertilizers, fungicides and human food. Also used for wood preservation, water and sewage treatments, as a flame retardant, and in cement production processes.

Restrictions on use

Avoid release into the environment; use personal protective equipment.

1.3 Details of the supplier of the safety data sheet

Company	: Kimleigh Chemicals SA (Pty) Ltd
Address	: 11 Jasper van der Westhuizen Street, Potchindustria, Potchefstroom 2531, North West province, South Africa
Telephone	: +27 18 293 1028; +27 18 285 1014
E-mail address	: sheq@kimleigh.co.za

1.4 Emergency telephone number

Emergency phone number: +27 18 293 1028; +27 18 285 1014
Monday to Thursday from 7:00 a.m. to 5:00 p.m.; Friday from 7:00 a.m. to 14:00 p.m.

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev.9 and Regulation (EC) No 1272/2008

GHS Hazard class	GHS Hazard category	GHS Hazard statement codes
Acute toxicity (Oral)	4	H302
Skin corrosion / irritation	2	H315
Serious eye damage / irritation	1	H318

2.2 Label elements

Labelling according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev.9 and Regulation (EC) No 1272/2008

Pictogram(s)		
Signal word(s)	Danger	

Hazard statement(s)

H302	: Harmful if swallowed.
H315	: Causes skin irritation.
H318	: Causes serious eye damage.

Precautionary statement(s)

P264 + P265	: Wash hands thoroughly after handling. Do not touch eyes.
P270	: Do not eat, drink or smoke when using this product.
P280	: Wear protective gloves / protective clothing / eye protection / face protection / hearing protection.
P301 + P317 + P330	: IF SWALLOWED: rinse mouth and get medical help.
P302 + P352	: IF ON SKIN: wash with plenty of water.
P305 + P317 + P338 + P354	: IF IN EYES: immediately rinse with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical help.
P332 + P317	: If skin irritation occurs: get medical help.
P362 + P364	: Take off contaminated clothing and wash it before reuse.
P501	: Dispose of contents/container in accordance with national regulations.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition / Information on ingredients

3.1 Substances

Chemical identity (IUPAC / CAS name)	: Ferrous sulphate monohydrate
Common name	: Ferrous sulphate monohydrate
Synonyms	: Iron (II) sulphate hydrate; Iron ($^{2+}$) sulphate monohydrate.
Formula	: $FeSO_4 \cdot H_20$

Molecular weight	: 169.92 g/mol
Appearance	: White / off-white crystals, odourless.
Purity	: 92 % w/w; Iron (Fe) as 30 % min.

Compound	CAS No.	EC No.	Index No.
Ferrous sulphate monohydrate	17375-41-6	231-753-5	Not available

SECTION 4: First-aid measures

4.1 Description of first-aid measures

General advice
Consult a physician in case of emergency. Show this safety data sheet to the doctor in attendance.

If inhaled
Following inhalation, move the affected person to fresh air. If not breathing, give artificial respiration. If difficulty breathing, give oxygen. Seek medical attention.

In case of skin contact
In case of contact, immediately rinse skin with copious amounts of cold water, while removing contaminated clothes and shoes. Cover the irritated skin with an emollient. Wash exposed clothing and shoes before reuse. Seek medical attention if irritation persists.

In case of eye contact
In case of contact, remove any contact lenses and rinse eyes with copious amounts of water for at least 15 minutes. Cold water may be used. Seek immediate medical attention.

If swallowed
Following ingestion, rinse mouth with copious amounts of water. Seek immediate medical attention. Do not induce vomiting unless directed otherwise by a medical practitioner. Never administer anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

If inhaled
Coughing; dry throat; irritation of nasal and respiratory passages; shortness of breath.

In case of skin contact
Redness; itching.

In case of eye contact
Causes serious eye damage; redness; pain; watering; itching and visual disturbances such as blurred vision.

If swallowed
Possible nausea; vomiting; diarrhoea and shock. Pink urine discolouration is a strong indicator of iron poisoning. Liver damage, coma and death from iron poisoning has been recorded. Smaller doses are more toxic to children.

4.3 Indication of any immediate medical attention and special treatment needed
Physician should treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use dry chemicals, carbon dioxide (CO_2), alcohol-resistant foam, water spray or fog. The product is non-combustible / non-flammable.

Unsuitable extinguishing media
No limitations on extinguishing agents are available.

5.2 Special hazards arising from the substance or mixture
Produces oxides of sulphur and iron on combustion or thermal decomposition.

5.3 Special PPE and precautions for firefighters
In the event of fire, wear positive-pressure self-contained breathing apparatus and appropriate protective clothing. Prevent fire extinguishing water from contaminating surface and ground water reservoirs by containing and keeping the run-off water separate.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
Wear respiratory protection. Avoid dust formation. Avoid inhalation of dust, vapours, mist or gas. Ensure adequate ventilation. Avoid contact with skin and eyes. Evacuate personnel to safe areas.
For personal protection, please see section 8.

6.2 Environmental precautions

Avoid release into the environment. Do not discharge into drains, sewage systems or onto the ground. Avoid spillage or run-off entering drains, sewage systems or watercourses. Immediately report uncontrolled spillage or discharges to an appropriate regulatory body.

6.3 Methods and materials for containment and cleaning up

Cover drains. Do not touch spilled material. Collect dry powder using a special dust vacuum cleaner or carefully sweep into suitable waste container for disposal according to national regulations and seal securely. Avoid generating dust. Label the container appropriately and remove from the area as soon as possible.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Handle with care in accordance with good industrial hygiene and safety practices. Do not swallow or inhale dust, spray, mist or vapours. Avoid contact with eyes, skin and any form of ingestion. Avoid the formation of dust and aerosols. Wear suitable protective clothing such as overalls, boots, rubber gloves, safety goggles, nose and mouth protection. Wash contaminated clothing daily. Provide appropriate ventilation where dust formation might occur. If skin or eye contact occurs, wash thoroughly with water.

Do not eat, drink or smoke when using this substance. Avoid contamination of food, foodstuffs, eating utensils and drinking water by washing-up before entering eating areas. Do not discharge product residues into the environment.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Store in an airtight container in a cool, dry and well-ventilated place. Keep away from food, foodstuffs, incompatible substances, steel structures or steel components. Close container tightly after opening.

Minimize dust generation and accumulation. Store away from direct sunlight, moisture, heat, oxidisers, galvanized surfaces, unalloyed steel, bases and non-acid-proof metals.

Store under lock and key, and keep out of reach of children, uninformed persons and livestock.

SECTION 8: Exposure controls / Personal protection

8.1 Control parameters

Occupational exposure limits (OEL)

GN 280 of 29 March 2021; Regulations for Hazardous Chemical Agents, Government Gazette, RSA. : The OEL eight-hour TWA is 2 mg/m^3 for Iron salts (as Fe).

8.2 Appropriate engineering controls

Provide adequate general and local exhaust ventilation to ensure that the airborne levels remain below the recommended exposure limits. Mechanical ventilation should be used if dust formation occurs. Avoid contact with eyes, skin and clothing. Wash hands immediately after handling the product. Comply with good industrial hygiene practices. Provide an eyewash station and a safety shower in case of emergency.

8.3 Personal protective equipment

Eye/Face protection	: Use safety goggles that are compliant with the EN 166 standard as a minimum.
Skin protection	: Nitrile or neoprene gloves that are compliant with the EN 374 standard as a minimum.
Body protection	: Wear protective clothing that are compliant with the EN 368 standard as a minimum.
Respiratory protection	: Wear approved respiratory protection that are compliant with the EN 140 standard as a minimum.
Control of environmental exposure	: Do not let the substance enter drains or sewage systems and prevent leakages or spillage or any form of discharge into the environment. Do not allow the substance to contaminate ground water systems.

SECTION 9: Physical and chemical properties

Physical state	: Powder
Colour	: Grey / Off-white
Odour	: Odourless
pH (50 g/L at 20 °C)	: 3.0 – 5.0
Melting point/freezing point	: > 300 °C (decomposes without melting)
Initial boiling point and boiling range	: Decomposes before boiling

Flammability	: Not flammable
Lower and upper explosion limit / flammability limit	: No data available
Flash point	: Not applicable. The substance is an inorganic solid.
Auto-ignition temperature	: No data available.
Decomposition temperature	: > 300 °C.
Kinematic viscosity	: No data available.
Solubility	: Soluble in water at 295 g/L at 25 °C.
Partition coefficient (n-octanol/water)	: Not applicable. The substance is an inorganic solid.
Vapour pressure	: 0 Pa at 20 °C.
Density (relative)	: 3.0 g/cm^3 at 22 °C
Relative vapour density	: Not applicable. Substance is a solid.
Particle characteristics	: < 500 µm.

SECTION 10: Stability and reactivity

10.1 Reactivity
The product loses water in dry air and oxidizes upon exposure to moisture, forming a brown coating of extremely corrosive basic ferric sulphate.

10.2 Chemical stability
The substance is chemically stable under standard ambient conditions (room temperature). No decomposition will occur if the substance is used and stored according to specifications.

10.3 Possibility of hazardous reactions
Reacts in moist air to form ferric sulphate.

10.4 Conditions to avoid
Exposure to moisture and heat. Avoid dust formation.

10.5 Incompatible materials
Avoid contact with strong oxidizing agents and alkali metals.

10.6 Hazardous decomposition products
Iron and sulphur oxides, together with toxic sulphur dioxide fumes.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Classification according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev.9, The National Institute for Occupational Safety and Health (NIOSH) and Regulation (EC) No 1272/2008

Acute toxicity:

Route of exposure	Dose / concentration; test subject	Numerical measures	ATE Actual / Converted
Ingestion (oral)	LD_{50}; rats	300 - 2000 mg/kg bw	500 mg/kg bw
Inhalation	LD_{50}; rats	> 1.1 mg/L	No deaths reported at this high attainable value; therefore, no true LD_{50}.
Dermal	LD_{50}; rats	> 2000 mg/kg	2500 mg/kg bw

Skin corrosion / irritation:
Rabbit skin clipped sites (5 cm^2) – semi-occlusive dressing with 0.5 g moistened product (72-h exposure)
Result – Erythema and slight oedema present; reversible lesions; therefore, mild skin irritant.
OECD Test Guideline 404

Serious eye damage / eye irritation:
White rabbit eyes – 0.1 g into conjunctival sac (72h exposure)
Result – Corneal opacity or epithelial damage observed, conjunctival redness, chemosis and discharge observed in all the test animals; therefore, a serious eye irritant.
OECD Test Guideline 405

Respiratory or skin sensitization:
No data available for respiratory sensitization.
For skin sensitization:
Mouse local lymph node assay; 50 % w/v solution (72 h exposure).
Result – Negative; therefore, not sensitizing.
OECD Test Guideline 429

Germ cell mutagenicity:
All members of the iron salt category are deemed non-genotoxic and accordingly do not need to be classified according to Council Directive 2001/59/EC (28th ATP of Directive 67/548/EEC) and according to CLP (5th ATP of Regulation (EC) No 1272/2008 of the European Parliament and of the Council) as implementation of UN-GHS in the EU.

Carcinogenicity:
No classification necessary, based on the fact that results obtained for the read-across substance $FeCl_3$ shows no carcinogenic nature.

Reproductive toxicity:
No classification necessary, based on the fact that results obtained for the read-across substances $FeCl_3$ and $FeSO_4•7H_2O$ show no reproductive or developmental toxicity.

Specific target organ toxicity (STOT) - single exposure:
No data is available for Ferrous sulphate monohydrate in this regard.

Specific target organ toxicity (STOT) - repeated exposure:
No classification necessary, based on the fact that results obtained for the read-across substance $FeCl_3$ shows no toxicity after repeated exposures.

Aspiration hazard:
No data is available for Ferrous sulphate monohydrate.

11.2 Additional Information
No further data available.

SECTION 12: Ecological information

12.1 Toxicity
Classification according to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev.9, The National Institute for Occupational Safety and Health (NIOSH) and Regulation (EC) No 1272/2008

Type of toxicity	Dose / concentration administered	Numerical measures	References
Short-term (acute) aquatic hazard	LC_{50} in Fish EC_{50} in Crustacea	16.6 mg Fe/L/96h (= 48.98 mg $FeSO_4•H_2O$) 1.29 mg Fe/L/48h (= 3.92 mg $FeSO_4•H_2O$)	ECHA, 2023
Long-term (chronic) aquatic hazard	LOEC in Fish LOEC in Crustacea	1.61 mg Fe/L (= 4.89 mg $FeSO_4•H_2O$) 1.26 mg Fe/L (= 3.83 mg $FeSO_4•H_2O$)	ECHA, 2023

At all of these concentrations it can be expected that, under the test conditions, most of the iron will be present as undissolved and precipitated ferric hydroxide. However, it should be noted that most of the effects observed are due to the particulate nature of the formed iron hydroxide (ferric form) rather than the toxic properties of the

dissolved Fe (II) ion as such. It is therefore highly likely that observed effects on fish and invertebrates will be due to smothering or clogging of the gills or respiratory membranes. Filtrating organisms like daphnids would ingest precipitating particles and therefore be unable to feed normally. Effects on aquatic plants and algae will be due to impairment of photosynthesis by light interception. Growth of aquatic plants and algae can also be inhibited as a consequence of nutrient (phosphate) chelation.

12.2 Persistence and degradability

Biodegradation tests are not applicable to inorganic substances like Iron. As an alternative, the concept of "removal from the water column was developed. Rapid removal (defined as > 70% removal within 28 days) is considered equivalent to rapid degradability. Iron is rapidly removed from the water column, as iron forms metal hydroxides; therefore, iron is considered as equivalent to being rapidly degradable for the purpose of chronic aquatic classification (ECHA, 2023).

12.3 Bioaccumulative potential

Iron sulphate monohydrate is unlikely to bioaccumulate in any organism, due to an organism's ability to regulate its intake and loss from natural sources seeing as it is an essential trace nutrient in animals and is required for important biological processes.

12.4 Mobility in soil

Seeing as this substance is rapidly removed from the water column, it spreads easily throughout the environment *via* water systems.

12.5 Other adverse effects

Care should be taken to minimize the amount of Ferrous sulphate monohydrate released into the environment. Even though Iron is an essential micronutrient for healthy plant growth, it can be harmful to iron-sensitive plants in higher quantities.
This substance does not contribute to ozone depletion, ozone formation, global warming or acidification.

SECTION 13: Disposal considerations

The generation of waste should be restricted or minimized wherever possible. Any form of discharge or leakage into the environment, should be avoided. Do not dispose of this substance in the drain. Dispose of this substance in accordance with the regulations stipulated in the National Environmental Management Waste Act 2008 of South Africa.

SECTION 14: Transport information

	Land transport (UN TDG/ADR)	Sea transport (IMDG)	Air transport (IATA-DGR)
14.1 UN Number	N/A	N/A	N/A
14.2 UN Proper shipping name	Not classified as dangerous in the meaning of transport regulations	Not classified as dangerous in the meaning of transport regulations	Not classified as dangerous in the meaning of transport regulations
14.3 Transport hazard class(es)	N/A	N/A	N/A
14.4 Packing group	N/A	N/A	N/A
14.5 Environmental hazards	No	No marine pollutant	No

Key to abbreviations: N/A – not applicable

14.6 Transport in bulk according to IMO instruments

Maritime transport in bulk is not intended.

14.7 Special precautions for user

Ensure that packaging remains intact. Dust formation should be restricted wherever possible.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations specific for the substance or mixture

This material safety data sheet complies with the requirements stipulated in The Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 9th revised edition, United Nations: New York and Geneva, 2021.

National legislation

Occupational Health and Safety Act, 1993 - Hazardous Chemical Agent Regulations 2021.

Other regulations

European Agency for Safety and Health at Work (OSHA) guidelines.
The National Institute for Occupational Safety and Health (NIOSH) guidelines.

15.2 Chemical Safety Assessment

No chemical safety assessment was carried out for this substance.

SECTION 16: Other information

List of abbreviations

ADR	: European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	: Acute toxicity estimate
bw	: Body weight
CAS	: Chemical Abstracts Service
DGR	: Dangerous Goods Regulations
EC	: European Community
EC_{50}	: Half maximal effective concentration
ECHA	: European Chemicals Agency
EN	: European Nations
EU	: European Union
GHS	: Globally Harmonised System of Classification and Labelling of Chemicals
GN	: Government Notice
IATA	: International Air Transport Association
IMDG	: International Maritime Dangerous Goods
IMO	: International Maritime Organization
IUPAC	: International Union of Pure and Applied Chemistry
LC_{50}	: Lethal Concentration to 50% of a test population
LD_{50}	: Lethal Dose to 50% of a test population (Median Lethal Dose)
LOEC	: Lowest observed effect concentration
NIOSH	: The National Institute for Occupational Safety and Health
No.	: Number
OECD	: Organisation for Economic Co-operation and Development
OEL	: Occupational exposure limit
OSHA	: The Occupational Safety and Health Administration
PBT	: Persistent, bioaccumulative and toxic
PPE	: Personal protective equipment
RSA	: Republic of South Africa
STOT	: Specific target organ toxicity
TDG	: Transport of Dangerous Goods
TWA	: Threshold weighted average
UN	: United Nations
vPvB	: Very persistent and very bioaccumulative

References:

ECHA. 2023. Iron sulphate. Available at: https://echa.europa.eu/registration-dossier/-/registered-dossier/15513 (Accessed: 16.02.2023).

GHS. 2021. The Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 9th revised edition, United Nations: New York and Geneva. p. 550.

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