


1 Chemical product identification and information about manufacturer	
1.1 Substance identification	
Trade name	Iron Sulphate, Dechromator , Copperas
Technical name (as per ND)	Iron Sulphate, Iron copperas, technical grade
EINECS name	Iron sulphate
IUPAC name	Iron (II) sulphate
EINECS №	231-753-5
Molecular formula	Fe SO₄, Fe SO₄* n H₂O
REACH registration No	01-2119513203-57-0018
1.2 Intended use of substance	
As a coagulant for water and wastewater treatment, an additive to cement, iron pigment production, mineral feed additive for animals.	
1.3 Company/manufacturer identification	
Manufacturer	Public Joint-Stock Company SUMYKHIMPROM
Address	Kharkivska str., Sumy, Ukraine, 40003
Responsible person for manufacture and release of the goods	Manufacturing Director Mr. O. V. Denschikov
E-mail:	
Manufacturer's Special Representative for registration in accordance with Regulation (EC) №1907/2006 (REACH)	OSTHEM GERMANY GmbH Irene Nasdala Hamburg, Erdmann str. 10,22765 Germany
Telephone /telefax	E-mail irene.nasdala@ostchem.de +49 40 5300 300/ +49 40 5300 30 33

1.4 1.4 Emergency telephone for handling	
the substance	– 24 hours
If the emergency medical aid is necessary, turn	
to your local medical establishments	

2 Hazard (hazards) identification

Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]	Additional information
Acute Tox. 4 H302	
Eye Irrit. 2 H319	
Met. Corr. 1 H290	
Skin Sens. 1 H317	
Label elements	
Product identifier	Iron sulphate technical
Hazard pictograms	
Signal word	Warning
Hazard statements	H302: Harmful if swallowed. H315: Causes skin irritation. H319: Causes serious eye irritation H317: May cause an allergic skin reaction.

Precautionary statements	<p>P280: Wear protective gloves/protective clothing/eye protection/face protection.</p> <p>P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.</p> <p>P302+P352: IF ON SKIN: Wash with plenty of soap and water.</p> <p>P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p> <p>P310: Immediately call a POISON CENTER or doctor/physician.</p> <p>P501: Dispose of contents/container to an approved waste disposal plant.</p>
Other hazards	Iron sulphate is neither a PBT nor a vPvB substance.

3 Composition / data on components

Chemical name	% by weight	EINECS№	CAS №
Iron (II) Sulphate	68-84	231-753-5	7720-78-7
Iron Sulphate (Dechromator)			
Iron (II) Sulphate hydrated (sulphuric acid iron (2+) salt (1:1), hydrate)	10-88	231-753-5	13463-43-9
Iron (II) Sulphate tetrahydrate	12-90	231-753-5	20908-72-9
For Iron copperas			
Iron (II) Sulphate heptahydrate	94-98	231-753-5	7782-63-0

4 First aid measures

General information	In all cases of doubt, or when symptoms persist, seek medical attention and show label or this safety data sheet. If unconscious, place in the recovery position. Never give anything by mouth to an unconscious person. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Skin contact	Take the victim into fresh air, keep them warm and calm. In all cases of doubt, or when symptoms, e.g., irritation of respiratory pathways persist, seek medical attention. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Skin contact	In case of contact, wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If irritation persists seek medical advice.
Eye contact	If wearing contact lenses, remove them. Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. If irritation persists seek medical advice.
In case of ingestion	Do not induce vomiting. Give to drink plenty of water, give charcoal. Get medical aid immediately.

5. Fire safety measures and means

Fire and explosion safety	fire and explosion safe, non flammable
Fire fighting measures	adequate to the type of combustive substances, available in burning area
Dangerous products of thermal destruction	in the event of strong heating, iron and sulphur oxides are formed
Special fire preventing safety measures	none

6 Accidents and emergency situations, and their consequences, prevention and liquidation means

Personal protection/precautions	Avoid contact with eyes, skin or clothing. Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8.
Methods for cleaning up	Released material pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Contaminated residues dispose according to recommendations given in section 13.
Environmental precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminated ground water system. Local authorities should be advised if significant spillages couldn't be contained. If the product contaminates rivers, lakes or drains inform respective authorities.

7 Chemical products storage rules and handling when loading/unloading

Requirements at loading/unloading	Prevent aerosol formation when handling. Use local exhaust ventilation or other appropriate engineering controls to maintain exposures below occupational exposure limit. Apply respiratory organs, eyes and skin individual protection means. Containers, holding the substance, should be tightly closed and labeled.
Requirements at storage	Store in covered, dry warehouses on solid surface in original packaging from the manufacturer, excluding the impact of atmospheric precipitations and soil waters. Prevent dust dissemination in environment. Prevent the product ingress into surface and soil waters.
Storage special requirements	Protect from moisture and sun rays.

8 Dangerous impact control measures and individual protection means

8.1 Control parameters				
Occupational exposure limits				
Chemical Name		Country		OEL
Iron (II) sulphate		European Union		TLV = 6 mg/m ³ TWA = 2 mg/m ³
DNELs for workers and consumers based on repeat dose data (ECHA AF method)				
Population	DNEL (oral) mg/kg/day	DNEL (dermal) mg/kg/day	DNEL inhalation (mg/m ³)	Comments
Fe-based				
Consumer	0.29	0.29	0.50	Assumes 24 h/d exposure
Worker	-	0.57	2.01	Assumes 8 h/d exposure
FeSO₄				
Consumer	0.8	0.8	1.4	Assumes 24 h/d exposure
Worker	-	1.6	5.5	Assumes 8 h/d exposure
	Value	Assessment factor	Remarks/Justification	
PNEC _{sediment} (g Fe/kg dwt)	49.5	1	Indicative only, in the absence of intrinsic toxicity	
PNEC _{soil} (g/kg dwt)	55	1	Indicative only, in the absence of intrinsic toxicity	
PNEC _{stp} (mg Fe/L)	500	1	Based on evidence from routine use of iron salts in wastewater treatment plants, supported by	
			standard and non-standard studies.	
PNEC _{oral} (mg/kg food)			No potential for bioaccumulation	

8.2 Exposure controls

Personal protection	Avoid skin and eyes contamination. Wash hands before breaks and at the end of workday. Remove and wash contaminated clothing. When using does not eat, drink or smoke. Keep away from food, feed and drinks
Respiratory protection	Use dust respirator according to the EN149 equipped with the dust recovery filter according to the EN 143.
Hand protection	Wear protective gloves.
Eye protection	Wear dust-proof glasses according to the EN166. Maintain eye wash fountain and quick-drench facilities in work area.

Body protection	Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
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9 Physical and chemical properties

Physical state	crystals of grey-green or grey-brown color
Odor	odorless
Melting point	not reached, decomposes prior to melting point
Boiling temperature	decomposes prior to boiling point
Sparkling temperature, ignition temperature, self ignition temperature	incombustible
Decomposition temperature	480 °C (anhydrous), 260 °C (monohydrate), 65 °C (tetrahydrate)
Saturated vapour pressure	for anhydrous form - 28,9 gPa at 30,7 °C
Density	3,14 g/cm ³ (anhydrous), 3,0 g/cm ³ (monohydrate), 1,9 g/cm ³ (heptahydrate) at 20°C
pH of water suspension	iron sulphate heptahydrate: pH = 3-4 (at concentration of 50 g/l at 20 °C). Iron sulphate hydrate: pH = 3,2 (30% 1,8M at 25 °C). Iron sulphate: pH=3,7 (10% water solution)
Solubility	iron sulphate heptahydrate: water: 33g/100 g (at 0°C); 149g/100/g (at 50°C) iron sulphate hydrate: 30g/100 ml (at 25 °C) iron sulphate: 30g/100 g (at 25°C); Insoluble in fats. Practically insoluble in alcohols (ethanols, methanols).
Distribution factor in «octanolwater» system	no information found

10 Stability and reactivity

Stability	The substance is stable at adequate utilization and storage conditions.
Reactivity	Reacts with acids. Oxidizes in humid air. Forms adducts with methanol, aniline. Water solution of the product possesses reduction activity. Hygroscopic substance.
Incompatible	With strong oxidants, alkali, soluble carbonates, aurum and silver salts, lead acetate, lime milk, potassium iodide, potassium and sodium tartrate, sodium borate, tannin/
Conditions to be avoided	Prevent from heating, protect from moisture. In the event of strong heating, iron and sulphur oxides are formed. In air absorbers

	moisture from atmosphere. In high humidity conditions, makes corrosive impact on metals.
Substances, contact with which may cause dangerous reaction	none
Dangerous products of decomposition	none

11 Information about toxicity

11.1 Information on toxicological effects.				
Toxicokinetics, metabolism and distribution				
Non-human toxicological data		no bioaccumulation potential		
Human toxicological data		<p>Iron is an essential element, and plays an important role in biological processes, and iron homeostasis (biochemical mechanisms maintaining constant concentration in the cell) is under strict control.</p> <p>This water soluble inorganic iron salt do not undergo metabolism per se. As already mentioned iron is bound to transferrin for transport to the bone marrow or contained within storage forms.</p> <p>About 1 mg of iron is lost each day through sloughing of cells from skin and mucosal surfaces, including the lining of the gastrointestinal tract.</p> <p>No physiological mechanism of iron excretion exists.</p> <p>Consequently, absorption alone regulates body iron stores</p>		
Acute toxicity				
Exposure	Value	Exposure time period	Species	Method
oral: gavage	LD50: >400mg Fe/kg bw LD50>2000 mg salt /kg	Acute	rat	<i>OECD TG 401 and GLP</i>
oral	LD50 = 1000 mg/kg bw	Acute	human	according to EU Directive 93/21/EEC
Irritation		<p>Skin irritant Eye irritant Respiratory tract not irritant Ferrous sulfate is skin irritant based on (2:1 animals majority) in rabbit test and is eye irritant.</p>		
Respiratory or skin sensitisation		<p>Not sensitizing Results of a reliable LLNA test were clearly negative for ferrous sulfate heptahydrate</p>		
Mutagenicity		not genotoxic		
Carcinogenicity		not classified as cancerogenic		

Toxicity for reproduction	NOAEL = 1000 mg/kg body weight/day			
Repeated dose toxicity				
Exposure	Value	Exposure time period	Species	Method
oral	NOAEL >11.5 mg/kg/day	61 days	Rat	Appel et al., 2001

Ecotoxicity			
Aquatic toxicity	Effect dose	Exposure time	Species
Acute toxicity to fish	LC50 = 0,41 – 1,8 mg/L (measured dissolved Fe)	96 h	Salvelinus fontinalis
Acute toxicity to aquatic invertebrates	EC50 = 5.3 mg/L (nominal total Fe)	24 h	Daphnia magna
Acute toxicity to algae	EC50 = 18 mg/L (measured total Fe)	72 h	Pseudokirchneriella subcapitata
Mobility in soil			
<p>In surface impoundments Fe⁺⁺ may transit to Fe⁺⁺⁺, which is accompanied by absorption of the dissolved oxygen.</p> <p>Will transform in the environment into ferric salts (trivalent) (basic iron sulfate, iron sulfate, iron sulfate monohydrate, diiron trisulfate).</p>			
Persistence and degradability			
Abiotic Degradation			
Halftime	Method	Remark	
		<p>In natural ecosystems the absence of oxygen or low pH can result in iron salts remaining in solution but under such conditions environmental effects would be strongly influenced by these parameters. The presence of other ions in solution, such as carbonates and humates, is expected to stabilize ferrous but this is not expected to be a sufficient effect to overcome the precipitation.</p>	

Results of PBT and vPvB assessment	The substance is not PBT or vPvB.
Biodegradation	In effect, ferrous and ferric ions can be treated together, because the ferrous ion is rapidly transformed to ferric ion under the conditions found at typical points of release. Ferric ions released into (or generated in) water will rapidly precipitate as highly insoluble oxides and oxo-hydroxides. These stable compounds are exactly the forms in which iron is found naturally in the earth's crust.
Bioaccumulative potential	The available data on iron concentrations in the environment show the way that organisms display adaptation to the high background concentrations of iron.

13 Recommendations on wastes (residues) disposal

Appropriate disposal / Product	Waste disposal in strict correspondence with the state and local laws and regulations.
Waste codes / waste designations according to EWC / AVV	None, waste is not classified as hazardous according to the European Waste Catalogue (EWC) 2000/532/EC.
Appropriate disposal /Packaging	Dispose of container and unused contents in accordance with federal, state and local requirements.

14 Information for carriage (transportation)

Land transport (ADR/RID/GGVSE)	not classified
Sea transport (IMDG-Code/GGVSee)	not classified
Air transport (ICAO-IATA/DGR)	not classified
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	not classified

Additional information	The product is transported by railway (RID), road (ADR), and sea (IMDG) transport. The cargo is classified as non-hazardous in compliance with the international rules of carriage. Obligatory mark «Keep dry».
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15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance
EU regulation
Regulation (EC) No 1272/2008
Other regulations
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Chemical Safety Assessment
A chemical safety assessment has been carried out for the iron (II)sulphate

16 Other information

Relevant R- , H-, EUHphrases	H302: Harmful if swallowed. H315: Causes skin irritation. H319: Causes serious eye irritation H317: May cause an allergic skin reaction. P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. P302+P352: IF ON SKIN: Wash with plenty of soap and water.
	P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310: Immediately call a POISON CENTER or doctor/physician.
Abbreviation	PEL - permissible exposure limit OEL – occupational exposure limit REL – recommended exposure limit DNEL - derived no-effect level PNEC - predicted no effect concentration LD50 – lethal dose LC50 – lethal concentration EC50 - half maximal effective concentration NOAEL - no observed adverse effect level PBT or vPvB - persistent, bioaccumulative and toxic or very persistent very bioaccumulative TWA - Time-weighted average

	TLV -threshold limit value
Training instructions	The given document is targeted for personnel, dealing with the product carriage and utilization, with the purpose to learn the safety handling rules. Read carefully the SDS before using the product
Further information	Persons, subjected to the given document delivery, may undertake the independent estimation of the product appropriateness for their own needs. The user bares responsibility for appropriateness check and information integrity for his specific application sphere. The manufacturer will be grateful for sending the information about the product utilization, to undertake the extended risks evaluation, at the address indicated on page 1 .
Key literature references and sources for data	DSTU GOST 30333:2009 «Chemical Product Safety Data Sheet» DSTU 2463-94 (GOST 6981-94) Iron vitriol, technical grade TU U 24.1-05766356-072:2010 IRON SULPHATE. Technical specification TU U 20.1-05766356-075:2012 Iron Sulphate for the fodder industry mark F. Technical specification Chemical safety report for IRON SALTS CATEGORY. Chemical safety report for iron sulphate 2010-10-12 CSR-PI-5.2.6 GESTIS limit values database Safety data card of hazardous factor dated 03.09.2014 No 5383 B000010 Iron (II) sulfate. Safety data card of hazardous factor dated 10.03.2015 No 5919 B000306 Iron (II) sulfate heptahydrate. Safety data card of hazardous factor dated 04.08.2014 No 5274 B001403 Sulfuric acid, Iron (2+) salt(1:1), hydrate. CLP Regulation – Regulation (EC) by European Parliament and Council No.1272/2008 dd. 16 December 2008 on classification, marking and packing of substances and mixtures

Annex 1
EXPOSURE SCENARIOS ACCORDING TO CHEMICAL SAFETY REPORT

ES4: Water treatment: treatment of raw and potable waters

ES 5: Water treatment: treatment of waste waters and WWTP sludge

ES 7: Use as reactive product/precursor

ES 8: Manufacture of cement

ES 9a: Industrial use of cement

ES 9b and c: Professional and consumer use of cement

ES 13b and c Use in Agrochemicals (professional and consumer)

ES4: Water treatment: treatment of raw and potable waters			
	SU3, SU 0		
Use Descriptor			
	PROC 2, PROC 5, PROC 8a, PROC 8b ERC 4		
Process Categories and Environmental Release Categories			
Processes, tasks, activities covered	<p>PROC2 Use in closed, continuous process with occasional controlled exposure</p> <p>PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities</p> <p>PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>ERC4 Industrial use of processing aids in processes and products, not becoming part of articles</p>		
Operational conditions related to frequency, duration and amount of use	Used amount of substance per day	Approx. 1800 kg iron salt per day. (approx. 700 kg Fe/day)	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours (Default value)	
	Frequency of exposure at workplace [for one worker]	Daily	
	Annual amount used per site	210 t Fe/y	
	Emission days per site	300	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.

and characteristics of exposed humans	Area of skin contact with the substance under conditions of use	480 (PROC2, PROC5, PROC8b) 960 (PROC8a)	ECETOC assumptions for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers.
Risk management measures for industrial site			
Containment and local exhaust ventilation	Containment plus good work practice required	Yes	
	Local exhaust ventilation required plus good work practise	No	
Personal protective equipment (PPE)	Skin protection	Protective gloves	
	Eye protection	Safety glasses	
	Clothing	Working clothing worn.	
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used, in the absence of LEV	
	Breathing apparatus	None	
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.	
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.	
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.		
Exposure estimation			

Workers exposure Long-term exposure	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure.</p> <p><u>Dermal exposure</u> Dermal exposure is most likely to occur through accidental spillage or during dosing of the waste water, where mechanical handling is not in place. Potential exposure was estimated both with and without the presence of LEV. The presumption is that LEV will normally be present when diluting and manually dosing the salts to waste water but definitive evidence either way is lacking. The presence or otherwise of LEV has a substantial impact on the exposure estimate. Exposure during formulation and dosing is presumed to last from 15 minutes to one hour. In addition, it is recognised that in many instances the addition of salts to waste water is done <i>via</i> an automatic monitoring and dosing system which does not result in any likelihood for human exposure and, conversely, it may be done via non-dedicated addition points. These scenarios were assessed by varying the process categories but keeping all other conditions the same.</p> <p><u>Inhalation exposures</u> Inhalation exposure estimates have not performed since the iron salts used in this exposure scenario are non-volatile, and formulated and used in the form of solution. It is further assumed that there is no possibility of aerosol formation during the life cycle.</p>
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Environmental exposure

Life cycle stage	Industrial use (potable water)	Industrial use (industrial locations)
Fraction in formulation	0,2E-06	0,2E-05
Number of days	300	300
Amount per day	2000 m ³ /d	2000 m ³ /d
Fraction to air	-	-
Amount to air	0	0
Fraction to waste water (prior to WWTP)	-	0,5 kg/day
WWTP flow (default)	2000 m ³ /d	2000 m ³ /d
Dilution in surface water (default)	10	10

ES 5: Water treatment: treatment of waste waters and WWTP sludge

Use Descriptor	SU 3, SU 0
Process Categories and Environmental Release Categories	PROC 2, PROC 5, PROC 8a, PROC 8b ERC 4, ERC 5

Processes, tasks, activities covered	PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC: 8a Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities PROC:8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities ERC4: Industrial use of processing aids in processes and products, not becoming ERC 5: Industrial use resulting in inclusion into or onto a matrix		
Operational conditions related to frequency, duration and amount of use	Used amount of substance per day	Water treatment: 200 kg Fe/day assuming 2000 m ³ effluent Sludge treatment: approx. 34 kg Fe/day based on approx. 28 m ³ sludge/d	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours	
	Frequency of exposure at workplace [for one worker]	Daily	
	Annual amount used per site	85 T Fe/y	
	Emission days per site	365	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity and characteristics of exposed humans	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.
	Area of skin contact with the substance under conditions of use	480 (PROC2, PROC5, PROC8b) 960 (PROC8a)	ECETOC assumptions for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers.
Risk management measures for industrial site			
Containment and local exhaust ventilation	Containment plus good work practice required	Yes	
	Local exhaust ventilation required plus good work practise	No	
Personal protective equipment	Skin protection	Protective gloves	

(PPE)	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts, Filter mask P2 (FFP2) must be used, in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.	
Exposure estimation		
Workers exposure Long-term exposure	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure.</p> <p><u>Dermal exposure</u></p> <p>Dermal exposure is most likely to occur through accidental spillage or during formulation (transfer and charging of storage, mixing, and feed vessels) or during dosing of the waste water, where mechanical handling is not in place. Potential exposure was estimated both with and without the presence of LEV. The presumption is that LEV will normally be present when formulating and manually dosing the salts to waste water but definitive evidence either way is lacking. The presence or otherwise of LEV has a substantial impact on the exposure estimate. Exposure during formulation and dosing is presumed to last from 15 minutes to one hour. In addition, it is recognised that in many instances the addition of salts to waste water is done via an automatic monitoring and dosing system which does not result in any likelihood for human exposure and, conversely, it may be done via non-dedicated addition points. These scenarios were assessed by varying the process categories but keeping all other conditions the same.</p> <p><u>Inhalation exposures</u></p> <p>Inhalation exposure estimates are not performed for this exposure scenario as the iron salts are non-volatile, formulated and used in the form of solution. It is further assumed that there is no possibility of aerosol formation during the life cycle.</p>	
Environmental exposure		
Life cycle stage	Industrial use (potable water)	Industrial use (industrial locations)
Fraction in formulation	0,007	0,009
Number of days	365	365
Amount per day	200 kg Fe/day assuming 2,000 m ³ effluent kg/day	approx. 34 kg Fe/day based on approx. 28 m ³ sludge/day
Amount to air	0	0
Fraction to waste water (prior to WWTP)	1	1

WWTP flow (default)	2E+06 l/day	2E+06 l/day
Dilution in surface water (default)	10	10

ES 7: Use as reactive product/precursor			
Use Descriptor	SU3, 8, 9,10,14		
Process Categories and Environmental Release Categories	PROC 2, PROC 3, PROC 4, PROC 8b, PROC 9, PROC 22, PROC 15, PROC 26 ERC 6a, ERC 4, ERC 5, ERC 6b, ERC 1		
Processes, tasks, activities covered	<p>PROC 2: Use in closed, continuous process with occasional controlled exposure</p> <p>PROC3 Use in closed batch process (synthesis or formulation)</p> <p>PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises</p> <p>PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC9 Transfer of substance or preparation into small containers (dedicated filling line,including weighing)</p> <p>PROC 15: Use as laboratory reagent</p> <p>PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting</p> <p>PROC 26: Handling of solid inorganic substances at ambient temperature</p> <p>ERC 1: Manufacture of substances</p> <p>ERC 4: Industrial use of processing aids in processes and products, not becoming part of articles</p> <p>ERC 5: Industrial use resulting in inclusion into or onto a matrix</p> <p>ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates)</p> <p>ERC 6b: Industrial use of reactive processing aids</p>		
Operational conditions related to frequency, duration and amount of use	Used amount of substance at site per day	Approx. 20 tonnes iron salt per day	
	Duration of exposure per day at workplace [for one worker]	8 h/day	
	Frequency of exposure at workplace [for one worker]	daily	
	Used amount of substance at site per year	6000 tonnes/year	
	Emission days per site	300 d/y	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary

Operational conditions related to available dilution capacity and characteristics of exposed	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.
humans	Area of skin contact with the substance under conditions of use	240 (PROC3, PROC15) 480 (PROC2, PROC4, PROC8b, PROC9) 1980 (PROC22) PROC26 – not specified by ECETOC but assumed to be approx. 1980	ECETOC assumptions for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers.
Risk management measures for industrial site			
Containment and local exhaust ventilation	Containment plus good work practice required	Yes	
	Local exhaust ventilation required plus good work practise	No	
Personal protective equipment (PPE)	Skin protection	Protective gloves	
	Eye protection	Safety glasses	
	Clothing	Working clothing worn.	
	Respiratory protection	Refer to control technologies below	
	Breathing apparatus	Refer to control technologies below	
Other risk management measures related to workers	Procedural and control technologies	It is assumed that solid salts are handled only in closed systems or with LEV	
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.	
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.		
Exposure estimation			

<p>Workers exposure Long-term exposure</p>	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure.</p> <p><u>Dermal exposure</u> Dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place.</p> <p><u>Inhalation exposures</u> Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation. Use of iron salts in solution is unlikely to give any opportunity for inhalation; chances of aerosol formation are negligible. Where spray drying of the isolated product, e.g. Iron Blue pigment, this is done after a wash step to remove soluble salts; thus, there is little likelihood of the initial iron salt, e.g., ferrous sulphate or ferrous chloride, which is soluble, being released during spray drying.</p>	
<p>Environmental exposure</p>	<p>Standard equations, described in detail in the REACH guidance and implemented within the EUSES 2.1 software, are then used to determine Predicted Environmental Concentrations (PECs) in surface water, seawater, sediment and agricultural soil.</p>	
<p>Predicted Exposure Concentrations (PEC)</p>		
<p>Compartments</p>	<p>Local PEC</p>	<p>Justification</p>
<p>Surface water (in mg/l)</p>	<p>2.4E-06</p>	<p>Calculated using EUSES 2.1.1 in accordance with the exposure scenario.</p>
<p>Freshwater sediment (in g/kg dwt)</p>	<p>45.0</p>	<p>Calculated using EUSES 2.1.1 in accordance with the exposure scenario.</p>
<p>Agricultural soil (in g/kg dwt)</p>	<p>50.8</p>	<p>Calculated using EUSES 2.1.1 in accordance with the exposure scenario.</p>

ES 8: Manufacture of cement			
Use Descriptor	SU3; SU8, SU13		
Process Categories and Environmental Release Categories	PROC 3, PROC 4, PROC 5, PROC 9, PROC 8b, PROC 8a, PROC 14 ERC 2		
Processes, tasks, activities covered	<p>PROC 3: Use in closed batch process (synthesis or formulation)</p> <p>PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises</p> <p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)</p> <p>PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation</p> <p>ERC 2: Formulation of preparations</p>		
Operational conditions related to frequency, duration and amount of use	Used amount of substance per day	4.1 t Fe/d	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours	
	Frequency of exposure at workplace [for one worker]	Daily	
	Annual amount used per site	approx. 1450 t Fe/y	
	Emission days per site	350	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity and characteristics of exposed humans	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.
	Area of skin contact with the substance under conditions of use	240 (PROC3) 480 (PROC4, PROC5, PROC8b, PROC9, PROC14) 960 (PROC8a)	ECETOC assumption for exposed skin surface area.

	Body weight	70 kg	Default bodyweight for workers.
Risk management measures for industrial site			
Containment and local exhaust	Containment plus good work practice required	Yes	

ventilation	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.	

Exposure estimation	
Workers exposure Long-term exposure	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure.</p> <p><u>Dermal exposure</u> As described above, dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place. Dermal exposure estimates derived using the ECETOC TRA model can be found below. Note that the MPA website recommends the wearing of suitable eye protection, waterproof clothing, waterproof footwear and waterproof gloves when mixing and using cement. <u>Inhalation exposures</u> Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation. Inhalation exposure estimates derived using the ECETOC TRA model can be found below. It is assumed that PPE, LEV and mechanical handling would always be in place, given the hazardous nature of other cement ingredients besides FeSO₄.</p>

Environmental exposure

Life cycle stage	Formulation
Fraction in formulation	0.005
Number of days	350
Amount per day	~ 2.1kt cement equivalent to approx. 10 t per day iron salt (approx. 4.1 t Fe/day)
Fraction to air	-
Amount to air	0
Fraction to waste water (prior to WWTP)	2E-05
Fraction to sludge (passing to soil)	
Amount to waste water	0.08 kg/d
WWTP flow (default)	2E+06 l/d
Dilution in surface water (default)	10

ES 9a: Industrial use of cement			
Use Descriptor	SU3; SU 19		
Process Categories and Environmental Release Categories	PROC 5, PROC 8b, PROC 8a, PROC 10 ERC 8f, ERC 10a, ERC 5		
Processes, tasks, activities covered	PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 10: Roller application or brushing ERC 5: Industrial use resulting in inclusion into or onto a matrix ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release		
Operational conditions related to frequency, duration and amount of use	Used amount of substance per day	40 tonnes cement mix containing 200 kg iron salt (approx. 80 kg Fe)	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours	
	Frequency of exposure at workplace [for one worker]	Daily	
	Annual amount used per site	24 T Fe/y	
	Emission days per site	300	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity and characteristics of exposed humans	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.
	Area of skin contact with the substance under conditions of use	480 (PROC5, PROC8b) 960 (PROC8a, PROC10)	ECETOC assumption for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers.
Risk management measures for industrial site			
Containment and local exhaust ventilation	Containment plus good work practice required	Yes	

	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses

	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, LEV OR containment and ventilation must be available.
	Training, Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Waste related measures	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.	

Exposure estimation

Workers exposure Long-term exposure	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure.</p> <p><u>Dermal exposure</u> As described above, dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place. Dermal exposure estimates derived using the ECETOC TRA model can be found below. Note that the MPA website recommends the wearing of suitable eye protection, waterproof clothing, waterproof footwear and waterproof gloves when mixing and using cement.</p> <p><u>Inhalation exposures</u> Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation. Inhalation exposure estimates derived using the ECETOC TRA model can be found below. It is assumed that PPE, LEV and mechanical handling would always be in place, given the hazardous nature of other cement ingredients besides FeSO₄.</p>	
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Environmental exposure

Summary of environmental releases	Life cycle stage	Professional use – large scale
	Fraction in formulation	0.005
	Number of days	300

	Amount per day	40 t cement mix containing 200 kg iron salt (approx. 80 kg Fe)	
	Fraction to air	-	
	Amount to air	0	
	Fraction to waste water (prior to WWTP)	0.002	
	Amount to waste water	0.16 kg/d	
	WWTP flow (default)	2E+06 l/d	
	Dilution in surface water (default)	10	
Predicted Exposure Concentrations (PEC) for formulation	Compartments	Local PEC	Justification
	Surface water (in mg/l)	2.4E-06	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Freshwater sediment (in g/kg dwt)	45.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Agricultural soil (in g/kg dwt)	50.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.

ES 9b and c: Professional and consumer use of cement			
Use Descriptor	SU22; SU 13		
Process Categories and Environmental Release Categories	PROC 5, PROC 8b , PROC 8a, PROC 10, PROC 19, PROC 26 ERC 8f, ERC 10a, ERC 8c		
Processes, tasks, activities covered	<p>PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC 10: Roller application or brushing</p> <p>PROC 19: Hand-mixing with intimate contact and only PPE available.</p> <p>PROC 26: Handling of solid inorganic substances at ambient temperature</p> <p>ERC 8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix</p> <p>ERC 10a: Wide dispersive outdoor use of long-life articles and materials with low release</p> <p>ERC 8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix</p>		
Operational conditions related to frequency, duration and amount of use	Used amount of substance (as such or in preparation) per worker [workplace] per day	8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe)	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours	
	Frequency of exposure at workplace [for one worker]	Daily	
	Total annual amount of substance supplied per relevant preparation category	5.1 T Fe/y	
	Emission days per year related to that preparation category	300	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.

and characteristics of exposed humans	Area of skin contact with the substance under conditions of use	480 cm ² (PROC5, PROC8B) 960 cm ² (PROC8A, PROC10) 1980 cm ² (PROC19, assumed to apply for 26)	ECETOC assumption for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers.

Risk management measures for industrial site		
Containment and local exhaust ventilation	Containment plus good work practice required	Yes
	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves.
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used
	Breathing apparatus	None
Other risk management measures related to workers	Procedural and control technologies	If handling solid salts, containment and ventilation must be available.
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.
Risk management measures related to environmental emissions from wide dispersive professional use	Municipal or other type of external waste water treatment	Yes
	Effluent (of the waste water treatment plant) discharge rate	2000 m ³ /d
	Recovery of sludge for agriculture or horticulture	Yes
Waste related measures	For professional use, it is assumed that any unused product is disposed of as chemical waste and is not washed to drain. Equipment washing is unlikely to be carried out as standard. Spent packaging may be disposed of to landfill, recycling or by incineration	
Exposure estimation		

Workers exposure Long-term exposure	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely. The exposure levels from the ECETOC TRA model (2010) are used to estimate occupational exposure. <u>Dermal exposure</u></p> <p>As described above, dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place.</p> <p>Dermal exposure estimates derived using the ECETOC TRA model can be found below. Note that the MPA website recommends the wearing of suitable eye protection, waterproof clothing, waterproof footwear and waterproof gloves when mixing and using cement.</p> <p><u>Inhalation exposures</u></p> <p>Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation. Inhalation exposure estimates derived using the ECETOC TRA model can be found below. It is assumed that PPE, LEV and mechanical handling would always be in place, given the hazardous nature of other cement ingredients besides FeSO₄.</p>		
Environmental exposure			
Summary of environmental releases	Life cycle stage	Consumer use	Professional use – small-scale
	Fraction in formulation	0.005	0.005
	Number of days	365	300
	Amount per day	2.5 t cement mix containing 12 kg iron salt (approx. 5 kg Fe)	8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe)
	Fraction to air	-	-
	Amount to air	0	0
	Fraction to waste water (prior to WWTP)	0.02	0.02
	Fraction to sludge (passing to soil)		
	Amount to waste water	0.1 kg/d	0.34 kg/d
	WWTP flow (default)	2E+06 l/d	2E+06 l/d
	Dilution in surface water (default)	10	10
Predicted Exposure	Compartments	Local PEC	Justification

Concentrations (PEC) for consumer use	Surface water (in mg/l)	2.4E-06	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Freshwater sediment (in g/kg dwt)	45.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Agricultural soil (in g/kg dwt)	50.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
Predicted Exposure Concentrations (PEC) for professional use (small scale)	Compartments	Local PEC	Justification
	Surface water (in mg/l)	2.4E-06	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Freshwater sediment (in g/kg dwt)	45.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.
	Agricultural soil (in g/kg dwt)	50.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.

ES 13b and c Use in Agrochemicals (professional and consumer)	
Use Descriptor	SU22 SU 21; SU 13
Process Categories and Environmental Release Categories	PROC1, PROC2, PROC8a, PROC8b, PROC11, PROC13 ERC8a, ERC 8d
Processes, tasks, activities covered	<p>PROC 1: Use in closed process, no likelihood of exposure</p> <p>PROC 2: Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities</p> <p>PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities</p> <p>PROC 11: Non industrial spraying</p> <p>PROC 13: Treatment of articles by dipping and pouring</p> <p>ERC 8a: Wide dispersive indoor use of processing aids in open systems</p> <p>ERC 8d: Wide dispersive outdoor use of processing aids in open systems</p>

Operational conditions related to frequency, duration and amount of use	Used amount of substance per day	Approx. 330 kg Fe/d in local area	
	Duration of exposure per day at workplace [for one worker]	Up to 8 hours	
	Frequency of exposure at workplace [for one worker]	Daily	
	Annual amount used per site kg/y	80 t agrochemical products in the local area /y, assumed to contain not more than 40 tonnes Fe	
	Emission days per site	120	
Operational conditions and risk management measures related to product characteristics	Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)	Physical state at STP.
	Risk management measures related to the design of product	Precautions against irritation	As necessary
Operational conditions related to available dilution capacity and characteristics of exposed humans	Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.
	Area of skin contact with the substance under conditions of use	240 cm ² (PROC1) 480 cm ² (PROC2, PROC8B, PROC9, PROC13) 960 cm ² (PROC8A) 1500 cm ² (PROC11)	ECETOC assumptions for exposed skin surface area.
	Body weight	70 kg	Default bodyweight for workers
Risk management measures for industrial site			
Containment and local exhaust	Containment plus good work practice required	Yes	

ventilation	Local exhaust ventilation required plus good work practise	No
Personal protective equipment (PPE)	Skin protection	Protective gloves
	Eye protection	Safety glasses
	Clothing	Working clothing worn.
	Respiratory protection	If handling solid salts , Filter mask P2 (FFP2) must be used If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
	Breathing apparatus	None

Other risk management measures related to workers	Procedural and control technologies	<p>If handling solid salts, containment and ventilation must be available.</p> <p>If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.</p> <p>If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.</p>	
	Training. Monitoring/reporting and auditing systems	Equipment must be well maintained and cleaned daily.	
Waste related measures	<p>A limited release to drain is assumed which is related to an assumption of equipment washing.</p> <p>Spent packaging may be disposed of to landfill, recycling or by incineration</p>		
Exposure estimation			
Workers exposure Long-term exposure	Routes of exposure	Concentrations	Justification
	Dermal local exposure (in $\mu\text{g}/\text{cm}^2$)	200 (PROC8b, in absence of LEV)	The wearing of gloves is accounted for in this value
	Dermal systemic exposure via contact with substance as such (in $\text{mg}/\text{kg bw}/\text{d}$)	0.27 (PROC8a)	The limitation of 10% dermal uptake is assumed in deriving this value.
	Dermal systemic exposure via aqueous solution (in $\text{mg}/\text{kg bw}/\text{d}$)	0.027 (PROC8a)	The limitation of <1% dermal uptake is assumed in deriving this value.
	Inhalation exposure	Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product See also below	
	<p>Inhalation exposure (in mg/m^3)/8h workday</p> <p>(refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)</p>	2.0 – 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.	Derived using Stoffenmanager scenario assuming handling of product with low speed or with little force in medium quantities

	<p>Inhalation exposure (in mg/m³)/8h workday (refers only to any contributing tasks involving spraying of liquid product)</p>	<p>3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker</p>	<p>Derived using Stoffenmanager scenario assuming handling of liquids using low pressure, low speed and on medium-sized surfaces</p>
<p>Environmental exposure</p>	<p>The local release of iron-containing fertiliser is envisaged as passing to soil only. Such products are envisaged to be granular solid formulations requiring no cleaning of equipment.</p> <p>Iron-based fertilisers are only likely to be used in circumstances where the local iron levels are deficient and detrimental to plant growth. In terms of this assessment, the application level is such as to return iron levels back to at or approaching normal background levels.</p> <p>There is no need for further evaluation for the environment.</p>		