Safety Data Sheet

according to Regulation (EC) No 1907/2006 (REACH)
and Commission Regulation (EU) No 453/2010

Technical purified aluminum sulphate

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY

1.1 Product identifier	
Substance name	Aluminium sulphate
Trade name	Technical purified aluminum sulphate
ES#	233-135-0
IUPAC	Aluminium sulfate
CAS#	10043-01-3 (anhydrous)
Molecular formula	Al.3/2H2O4S ·n H_2O
This substance not classified according to the Annex I of Directive 67/548/EEC and Annex VI of Regulation (EC) N 1272/2008	
REACH registration No	01-2119531538-36-0065

1.2 Relevant identified uses of the substance or mixture and uses advised against	
Identified uses	Agent in treatment of surface water Agent in treatment of industrial waste waters Agent in papermaking Industrial manufacture of chemicals Raw material for chemical synthesis Mordant in dying, fireproofing, waterproofing textiles and paper products Surface coating agent for titanium dioxide Photosensitive agent and other use in photo-chemicals pH-regulating agent Surface active agent Tanning agent Plating agent and metal surface treating agent Use in manufacturing of adhesives, resins and construction chemicals
Uses advised against	None

1.3 Details of the supplier of the safety data sheet	
Manufacturer	PJSC “UKRAINIAN CHEMICAL PRODUCTS” 01601, Kiev, 2A Mechnykova St., Ukraine
Only representative	OSTCHEM Germany GmbH Hamburg, Erdmannstr. 10, Germany, 22765 Larissa Schmelzing/ Irene Nasdala tel. +49 40 5 300 300 (working time only) Fax: + 49 40 5 300 30 33 E-mail: larissa.schmelzing@ostchem.de irene.nasdala@ostchem.de
Responsible person	Head of R&D Department. Address: 01601, Kiev, 2A Mechnykova St., Ukraine Tel: +38 06567 3 75 14 (working time only) kaplichenko_da@titanexport.com
1.4 Emergency telephone number	
+38 06567 3 75 35 (twenty-four-hour)	

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance			
Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]	**Classification according to 67/548/EEC or 1999/45/EC**	**Self classification**	**Additional information**
Not classified	Not classified	Met. Corr. 1 H290 Eye Irrit. 2 H319	As notified to C&L inventory

Human Health effects	
Inhalation	May cause irritations of the mucosa of the respiratory tract and, in part, reactions resembling asthma
Eyes	May cause lachrymation (tears), heating and conjunctivitis.
Skin	No adverse effects reported
Swallowing	May cause irritation of the gastrointestinal tract, nausea, vomiting, severe abdominal pain and diarrhoea

2.2 Label elements	
Product identifier	Aluminium sulphate, no index #.
Hazard pictogram	 GHS07: exclamination mark
Signal word	Warning
Hazard statements	H290: May be corrosive to metals. H319: Causes serious eye irritation.
Precautionary statements	P264: Wash hands thoroughly after handling. P280: Wear protective gloves/protective clothing/eye protection/face protection. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313: If eye irritation persists: Get medical advice/attention. P406: Store in corrosive resistant container with a resistant inner liner
2.3 Other hazards	
Aluminium sulphate is neither a PBT nor a vPvB substance	

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances			
Chemical name	**EINECS #**	**CAS #**	**Concentration, range % (w/w)**
Aluminium sulphate hexadecahydrate			
Aluminium sulphate hexadecahydrate	233-135-0	16828-11-8	> 97 - <=100
Magnesium sulphate	231-298-2	7487-88-9	> 0 – <= 0.5
Sodium sulfate	231-820-9	7757-82-6	> 0 – <= 0.34
Sulphuric acid free	231-639-5	7664-93-9	> 0 - <= 0.2
Aluminium sulphate octadecahydrate			
Aluminium sulphate octadecahydrate	233-135-0	7784-31-8	> 97 - <=100
Magnesium sulphate	231-298-2	7487-88-9	> 0 – <= 0.47
Sodium sulfate	231-820-9	7757-82-6	> 0 – <= 0.32
Sulphuric acid free	231-639-5	7664-93-9	> 0 - <= 0.18

Additional information
Technical purified aluminum sulphate is supplied in forms of octadecahydrate or hexadecahydrate.

4. FIRST AID MEASURES

4.1 Description of first aid measures	
General informations	**In case of inhalation:** Supply fresh air.Rinse mouth and nose with water. If symptoms persist, call a physician. **In case of eye contact:** Rinse immediately with plenty of lukewarm water, also under the eyelids, for several minutes. Consult a physician immediately. Continue rinsing eyes during transport to hospital. **In case of ingestion:** Do NOT induce vomiting. Rinse mouth with water. Drink 1 or 2 glasses of water or milk. Never give anything by mouth to an unconscious person. **In case of skin contact :** Wash off with plenty of water and soap. Remove and wash contaminated clothing before re-use.
4.2 Most important symptoms and effects, both acute and delayed	
In case of inhalation	Irritation of the mucosa of the respiratory tract
In case of eye contact	Irritation, lachrymation (tears), heating and conjunctivitis.
In case of skin contact	Prolonged exposure in some instances may cause dermatitis
In case of ingestion	Nausea, vomiting and diarrhea.
Information to physician	Treat symptomatically and supportively.
First aid arsenal	Universal medical kit with a set of drugs (in consultation with the medical department of the enterprise).

4.3 Indication of any immediate medical attention and special treatment needed
Immediate first aid attention is not expected

5. FIREFIGHTING MEASURES

5.1 Extinguishing media	
Suitable extinguishing media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Using extinguishing media depends on fire hazard/explosion characteristics of combustibles in area.
Unsuitable extinguishing media	None
5.2 Special hazards arising from the substance or mixture	
Hazardous combustion products	Sulphur oxides (SOx) may be released when heating above the decomposition temperature.
Special protective equipment for fire-fighters	Wear full protective clothing and NIOSH-approved self-contained breathing apparatus in case of large fire.
5.3 Advice for firefighters	
During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.	

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures	
6.1.1. For non-emergency personnel	Wear appropriate personal protective equipment as specified in Section 8 Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.
6.1.2. For emergency responders	Pick up spills and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Ventilate area of leak or spill. Keep unauthorized personnel away
6.2 Environmental precautions	
Cover the drains to prevent the product from entering the environment. If the product contaminates rivers and lakes or drains inform respective authorities.	
6.3 Methods and material for containment and cleaning up	
Sweep or vacuum up and place in an appropriate closed container. Cover large powder spill with plastic sheet or tarp to minimize spreading. Clean up residual material by washing area with water and detergent. For aqueous solutions: Restrict the spread of the spillage by using inert absorbent material (sand, gravel).	
6.4 Reference to other section	
Information about personal precautions - see Section 8. Information about waste disposal - see Section 13.	

7. HANDLING AND STORAGE

7.1 Precautions for safe handling	
Precautions for safe handling	The work place and work methods shall be organized in such a way that direct contact with the product is prevented or minimized. Avoid excessive generation of dust.
Fire preventions	Not flammable product. No special precautions.
Aerosol and dust generation preventions	Use local exhaust ventilation or other appropriate engineering controls to maintain dust exposures below occupational exposure limit.
Electrostatics prevention	As a matter of good practice take measures to prevent the build up of electrostatic charge, such as ensuring all equipment is electrically grounded.
Safe transporting	Adhere to the rules on the transport of goods, which operate for the appropriate type of transport. Not violate the integrity of container. During loading works execute instructions and rules for the appropriate works. See section 14.
Advice on general occupational hygiene	Eye wash bottle or emergency eye-wash fountain must be found in the work place. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed.
7.2 Conditions for safe storage, including any incompatibilities	
Technical measures and storage conditions	Keep away from incompatible products. Avoid freezing. Avoid high temperatures.
Packaging materials	Package should exclude moisture penetration and guarantee the safety of the product during transportation and storage. Polypropylene bag or original Big-Bag of 25, 50, 650 и 1000 kg
Requirements for storage rooms and vessels	Store in the original container in closed storage rooms. Causes corrosion of metals in the presence of moisture. Store in a dry place.
7.3 Specific end use(s)	
None	

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters			
Occupational exposure limits			
Limit value type (country of origin)	**Substance name**	**Monitoring procedures**	**Occupational exposure limit value**

			Long term mg/m³	Short term mg/m³
Belgium (VLEP)	Aluminium salts, soluble	For the determination and assessment of dust exposure by inhalation one should use European Standard EN 689 "Workplace atmospheres – Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy" and national guidance documents.	2	-
Denmark (OEL)			1	2
France (VLEP)			2	-
Ireland			2	-
Spain (VLA)			2	-
Sweden (OEL)			1	-
Switzerland (MAK)			2 inhalable aerosol	-
United Kingdom (OEL)			2	-

DNEL/DMEL values:

Substance name	DNEL/DMEL			Exposure route	Exposure frequency	Remark
	Worker		Consumer			
	Industry	Professional				
Aluminium sulphate	DNEL = 20.2 mg/m³	-	-	inhalation	Long-term	AF = 25
	-	-	DNEL = 3.4 mg/kg bw/day	oral	Long-term	AF=100

PNEC values:

Substance name	PNEC	Value	Assessment factor	Remark/Justifications
Aluminium sulphate	aqua (freshwater)	PNEC = 0.3 µg/L	50	
	aqua (marine water)	PNEC = 0.03 µg/L	500	
	STP	PNEC = 20 mg/L	10	

8.2 Exposure controls

Occupational exposure controls

8.2.1 Appropriate engineering controls

Eye wash bottle or emergency eye-wash fountain must be found in the work place.
Good general ventilation should be sufficient to maintain exposure below the OELs

8.2.2. Individual protection measures, such as personal protective equipment

Respiratory protection	Use dust respirator according to the EN149 equipped with the dust recovery filter according to the EN 143.
Eye/face protection	Wear dust-proof glasses according to the EN166 or tight fitting goggles with side shields. Do not wear contact lenses when handling this product. It is also advisable to have individual pocket eyewash.
Skin/hand protection	Use protective clothing fully covering skin. Footwear resistant to caustics, and avoiding dust penetration.

	Wear gloves in a suitable material such as PVC, Neoprene or Natural rubber.
General hygiene considerations	Wash hands and face after handling, before eating, smoking and using the lavatory and at the end of the working period. Wash contaminated clothing before reusing.
8.2.3 Environmental exposure controls	
All ventilation systems should be filtered before discharge to atmosphere. The product won't produce toxic compounds in air and wastewaters in the presence of other substances or agents.	

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties	
Appearance	White solid granules max sized 20 mm (pale blue, gray or pink hues are admittable)
Odour	Not significant
Odour threshold	Not applicable
pH	3.0-3.3 (water solution 10g/100ml at 20 °C)
Melting point/range (°C)	Decomposes at 770 °C before melting. At 375 °C hydrates are mostly dehydrated.
Initial boiling point/range (°C)	Not applicable
Flash point (°C)	Not applicable
Evaporation rate	Not applicable
Flammability	Not applicable
Upper/lower flammability or explosive limits	Not applicable
Vapour pressure	Not applicable
Vapour density	Not applicable
Relative density (at 20°C)	1.79 g/cm³
Water solubility (at 20°C)	≥ 1000 g/l (miscible)
Partition coefficient n-Octanol/Water (log Po/w)	Not applicable
Auto-ignition temperature (°C)	Not applicable
Decomposition temperature (°C)	770
Viscosity	Solid, not applicable
Explosive properties	Non explosive
Oxidising properties	Non oxidising
9.2 Other information	
none	

10. STABILITY AND REACTIVITY

10.1 Reactivity	Not reactive under regular storage and use conditions.
10.2 Chemical stability	The product appears to be stable under normal use and recommended storage conditions.
10.3 Possibility of hazardous reactions	Hazardous polymerization does not occur. Dangerous reactions with bases i.e. chlorites, hypochlorites, sulphites.
10.4 Conditions to avoid	Avoid contact with most common metals (aluminium, copper,

	zinc and their alloys).
10.5 Incompatible materials	Non acid-proof metals (such as aluminium, copper and iron), bases, unalloyed steel, galvanized surfaces.
10.6 Hazardous decomposition products	Aluminium sulphate 18-hydrate begins to liberate water at 90 °C.Complete dehydration above 340 °C. Hazardous decomposition products formed under fire conditions: Sulphur oxides, Aluminum oxide

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects.	
Toxicokinetics, metabolism and distribution	
Non-human toxicological data	Aluminium accumulates in various tissues, especially in the skeleton, liver and testes. And a high intake of aluminium caused a negative phosphorus balance in the rat, with an increased output of phosphorus in the faeces. The average oral absorption was 0.037% for males and 0.001% for females. This indicates that absorption is very low. There seems to be a gender difference in the absorption of Aluminium Sulphate, with the males having the higher absorption. The excretion of aluminium in urine is very low,
Human toxicological data	None
Information on toxicological effects	

Acute toxicity:

Substance name	Exposure	Value	Exposure time period	Species	Method
Aluminium sulphate	oral	LD50 = 2000 mg/kg bw	one dose	rat	OECD Guideline 401
	dermal	LD50 = 5000 mg/kg bw	24 hours	rabbit	OECD Guideline 402
	inhalation	LC50 = 5000 mg/m³ air	4 hours (nose only)	rat	OECD Guideline 403

Irritation	**Skin**	Not irritating.
	Eye	Irritant Category 2A
	Respiratory tract	No information available: not required.
Respiratory or skin sensitisation	Not sensitising	
Germ cell mutagenicity	Negative	
Carcinogenicity	Negative	
Toxicity for reproduction	No abnormalities at any dose level. Established NOAEL =1000 mg/kg	

Repeated dose toxicity:

Substance name	Exposure	Value	Exposure time period	Species	Method

Aluminium sulphate	oral	NOAEL = 200 mg/kg bw/day	28 days	rat	OECD Guideline 422
	inhalation	LOAEC = 15.3 mg/m³	90 days	rat	OECD Guideline 413

12. ECOLOGICAL INFORMATION

12.1 Toxicity:

Aquatic toxicity:

Aquatic toxicity	Effect dose	Exposure time	Species
Acute toxicity to fish	LC50 = 1 mg/l (dissolved Al)	96 h	Danio rerio OECD Guideline 203
Long-term toxicity to fish	NOEC = 13 µg/l (dissolved Al)	60 days	Salvelinus fontinalis other guideline
Acute toxicity to aquatic invertebrates	EC50 = 0.33 mg/l (dissolved Al)	48 h	Daphnia magna OECD Guideline 202
Toxicity to aquatic algae and cyanobacteria	EC50 = 14 mg/l	72 h	P. subcapitata OECD Guideline 201

12.2 Persistence and degradability

Abiotic Degradation

Half-time	Method	Remark
30-7 days	hydrolysis	Since hydrolysis changes the chemical form but does not decompose aluminium and since characterization of total aluminium considers all chemical forms, the concept of degradation of aluminium by hydrolysis is not relevant in the consideration of its environmental fate.
Biodegradation		For inorganic substance biotic degradation is an irrelevant process, regardless of the environmental compartment that is under consideration: biotic processes may alter the speciation form of an element, but it will not eliminate the element from the aquatic compartment by degradation or transformation.

12.3 Bioaccumulative potential

The available evidence shows the absence of aluminium biomagnification acrosstrophic levels both in the aquatic and terrestrial food chains. The existing information suggests not only that aluminium does not biomagnify, but rather that it tends to exhibit biodilution at higher trophic levels in the food chain. BCFs for Aluminium can be found to range from quite low (~100) to quite high values (11,000)

12.4 Mobility in soil

As inorganic compounds, traditional degradation studies are not applicable. Due to the water solubility and the ionic nature, the substances are not expected to adsorb or bioaccumulate, water is the main target compartment, and the substance will not volatilize from soil.

12.5 Results of PBT and vPvB assessment

Aluminium sulphate is neither a PBT nor a vPvB substance.

12.6 Other adverse effects:

none

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods	
Appropriate disposal / Product	Waste disposal should be in strict correspondence with local and national laws and regulations.
Waste codes / waste designations according to EWC / AVV	Is not hazardous waste according Commission Decision 2000/532/EC and Directive 2008/98/EC
Appropriate disposal /Packaging	Contaminated package is to be disposed like the substance

14. TRANSPORT INFORMATION

The product is transported by railway (RID), road (ADR), and sea (IMDG) transport. The product is not considered as dangerous goods under TDG regulations.	
14.1 UN number	none
14.2 UN proper shipping name	Aluminium sulphate
14.3 Transport hazard class(es)	none
14.4. Packing group	none
14.5. Environmental hazards	none
14.6. Special precautions for user	Obligatory mark «Keep dry»
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	This product is out of the scope of Annex II of MARPOL 73/78.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance
Regulation (EC) No 1907/2006 Regulation (EC) No 1272/2008 Regulation (EC) No 453/2010
None
15.2 Chemical Safety Assessment
Chemical safety assessment has been carried for the product

16. OTHER INFORMATION

Relevant R- , H-, EUH-phrases	H290: May be corrosive to metals. H319: Causes serious eye irritation. P264: Wash hands thoroughly after handling. P280: Wear protective gloves/protective clothing/eye protection/face protection. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313: If eye irritation persists: Get medical advice/attention. P406: Store in corrosive resistant container with a resistant inner liner

Abbreviations	OEL – occupational exposure limit VLEP – valeurs limites d'exposition professionnelle - occupational exposure limit values VLA - valores límite ambientales – ambient limit values MAK - maximum workplace concentrations DNEL - derived no-effect level PNEC - predicted no effect concentration LD50 – lethal dose EC50 - half maximal effective concentration NOEC - no observed effect concentration NOAEL - no observed adverse effect level LOAEC - lowest observable adverse effect concentration BCF - bioconcentration factor LC50 - lethal concentration PBT or vPvB - persistent, bioaccumulative and toxic or very persistent very bioaccumulative
Training instructions	Read carefully the SDS before using the product. Train personnel in the safe use of chemical substances.
Further information	The data contained in the safety data sheet is based on the amount of information and experience available to the company at this time. A consumer of product is responsible for the consequences of its use in specific purposes. Information refers to this particular substance. It may be invalid in case this substance is used together with any other materials or any other production process.
Key literature references and sources for data	Chemical safety report for Aluminium sulphate. SDS for Technical Purified Aluminium Sulphate, Crimea Titan PJSC version 5.0 10.04.14. ECHA database on registered substances GESTIS database on international limit values GOST 12966-85 Technical Purified Aluminium Sulphate. Specifications

Annex 1 EXPOSURE SCENARIOS ACCORDING TO CHEMICAL SAFETY REPORT

ES1 – Formulation and Distribution of Aluminium salts – solid, low dustiness; max. Aluminium content = 25%

Section 1	Exposure Scenario Title
Title	**Formulation and Distribution of Aluminium salts; max. Aluminium content = 25%**
Use Descriptor	Sector of Use: SU10
	Process Categories: PROC1: Use in a closed process, no likelihood of exposure PROC2: Use in a closed continuous process, with occasional controlled exposure PROC3: Use in a closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where

	opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelletization PROC15: Use as a laboratory reagent PROC19: Hand-mixing with intimate contact and only PPE available
	Environmental Release Categories: ERC2: Formulation of preparations
Processes, tasks, activities covered	Adding Alu salts (Alu content = max. 25%) to liquid and solid formulations; includes distribution and associated laboratory activities. Distribution: loading and (re)packing of the substances.
GES exposure criteria	DNEL, inhalation long term: 1.8 mg/m3
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposure [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: Use suitable eye protection [PPE26]. Avoid skin contact: wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]	
PROC1:	No specific measures identified [EI18].

General exposures (closed systems) [CS15]. Continuous process [CS54]. Process sampling [CS2] (closed systems) [CS107]	*Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}.*
PROC2: General exposures [CS1]. Continuous process [CS54]. Process sampling [CS2] (open systems) [CS108]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}.*
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. ; With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} ;* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clear spills immediately [C&H13]}.*
PROC4: General exposures (open systems) [CS16]. Batch process [CS55] (open systems) [CS108]; Drum/batch transfers [CS8]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}; {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. ;* *{Clear spills immediately [C&H13]}.*
PROC5: General exposures (open systems) [CS16]. Mixing operations (open systems) [CS30]. Material transfers [CS3]. ; Batch process [CS55]. ; Cleaning [CS47].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} {Use drum pumps [E53]}.* *{Clean equipment and the work area every day [C&H3]}.* *{Clear spills immediately [C&H13]}.*
PROC8a:	No specific measures identified [EI18].

General exposures (open systems) [CS16]; Non-dedicated facility [CS82]; Material transfers [CS3]. ; Equipment cleaning and maintenance [CS39]. ; Bulk transfers [CS14].	*Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]. Dedicated facility [CS81] Material transfers [CS3]. Equipment cleaning and maintenance [CS39] Bulk transfers [CS14].	No specific measures identified [EI18]. {Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.
PROC9: General exposures [CS1]. Dedicated facility [CS81] Drum and small package filling [CS6]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} .{Clean equipment and the work area every day [C&H3]}.{Clear spills immediately [C&H13]}.*
PROC14: General exposures (open systems) [CS16] Production or preparation or articles by tabletting, compression, extrusion or pelletization [CS100]	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC15: General exposures [CS1]. Laboratory activities [CS36]. Small scale [CS61].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*

PROC19: General exposures [CS1]. Mixing operations (open systems) [CS30]. Manual [CS34].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]} ; {Clear spills immediately [C&H13]}*
Section 2.2	**Control of environmental exposure**
Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.	
Section 3	**Exposure Estimation**
3.1. Health	

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
1 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
2 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	0.500	5-25%	0.30	0.17
5 -Mixing or blending in batch processes (multistage and/or significant contact)	1.000	5-25%	0.60	0.33
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.100	5-25%	0.06	0.03
9 -Transfer of chemicals into small containers (dedicated filling line)	0.500	5-25%	0.30	0.17
14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation	1.000	5-25%	0.60	0.33
15 - Use of laboratory reagents in small scale laboratories	0.100	5-25%	0.06	0.03
19 - Hand-mixing with intimate contact (only PPE available	0.500	5-25%	0.30	0.17

3.2. Environment

N.A.	
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	
The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]	
4.2. Environment	
N.A.	
Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Use of PPE	Skin protection: Gloves: - Observe breakthrough time of the gloves used Respiratory protection: Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES2 – Use of Aluminium salts (solid, low dustiness) in synthesis as a process chemical and as an intermediate; Aluminium content = max. 25%

Section 1	**Exposure Scenario Title**
Title	**Use of Aluminium salts (solid, low dustiness) in synthesis as a process chemical and as an intermediate; Aluminium content = max. 25%**
Use Descriptor	Sector of Use: SU6b, SU8, SU9, SU14
	Process Categories: PROC1: Use in a closed process, no likelihood of exposure PROC2: Use in a closed continuous process, with occasional controlled exposure PROC3: Use in a closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC15: Use as a laboratory reagent
	Environmental Release Categories: ERC1: Manufacture of substances ERC2: Formulation of preparations ERC4: Industrial use ERC5: Industrial use resulting in inclusion into or onto a matrix ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC8a: Wide dispersive indoor use of processing aids in open systems
Processes, tasks, activities covered	Use of Aluminium salts (solid, low dustiness) in synthesis as a process chemical and as an intermediate. Includes material transfers and associated laboratory activities. Max. Aluminium content = 25%
GES exposure criteria	DNEL, inhalation long term: 1.8 mg/m3
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]

Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposure [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: Use suitable eye protection [PPE26]. Avoid skin contact: wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]	
PROC1: General exposures (closed systems) [CS15]. Continuous process [CS54]. Process sampling [CS2] (closed systems) [CS107]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}.*
PROC2: General exposures [CS1]. Continuous process [CS54]. Process sampling [CS2] (open systems) [CS108]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}.*
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. ; With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} ;* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clear spills immediately [C&H13]}.*

PROC4: General exposures (open systems) [CS16]. Batch process [CS55] (open systems) [CS108]; Drum/batch transfers [CS8]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}; {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. ; {Clear spills immediately [C&H13]}.*
PROC8a: General exposures (open systems) [CS16]; Non-dedicated facility [CS82]; Material transfers [CS3]. ; Equipment cleaning and maintenance [CS39]. ; Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]. Dedicated facility [CS81] Material transfers [CS3]. Equipment cleaning and maintenance [CS39] Bulk transfers [CS14].	No specific measures identified [EI18]. {Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.
PROC9: General exposures [CS1]. Dedicated facility [CS81] Drum and small package filling [CS6]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} .{Clean equipment and the work area every day [C&H3]}.{Clear spills immediately [C&H13]}.*

PROC15: General exposures [CS1]. Laboratory activities [CS36]. Small scale [CS61].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*

Section 2.2 Control of environmental exposure

Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.

Section 3 Exposure Estimation

3.1. Health

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
1 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
2 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	0.500	5-25%	0.30	0.17
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.500	5-25%	0.30	0.17
9 -Transfer of chemicals into small containers (dedicated filling line)	0.500	5-25%	0.30	0.17
15 - Use of laboratory reagents in small scale laboratories	0.100	5-25%	0.06	0.03

3.2. Environment

N.A.

Section 4 Guidance to check compliance with the Exposure Scenario

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]	
4.2. Environment	
N.A.	
Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Use of PPE	<u>Skin protection:</u> Gloves: - Observe breakthrough time of the gloves used <u>Respiratory protection:</u> Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES3 – Industrial and Professional use of Aluminium salts in spraying formulations – solid, low dustiness; max. Aluminium content = 25%

Section 1	Exposure Scenario Title
Title	**Industrial and Professional use of Aluminium salts in spraying formulations - solid, low dustiness; max. Aluminium content = 25%**
Use Descriptor	Sector of Use: SU5, SU6b, SU7
	Process Categories: PROC1: Use in a closed process, no likelihood of exposure PROC2: Use in a closed continuous process, with occasional controlled exposure PROC3: Use in a closed batch process (synthesis or formulation) PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC7: Industrial spraying PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC11: Non industrial spraying PROC19: Hand-mixing with intimate contact and only PPE available
	Environmental Release Categories: ERC3: Formulation in materials ERC4: Industrial use ERC5: Industrial use resulting in inclusion into or onto a matrix ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b: Industrial use of reactive processing aids ERC8a: Wide dispersive indoor use of processing aids in open systems ERC8b: Wide dispersive indoor use of reactive substances in open systems ERC8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC11a: Wide dispersive indoor use of long-life articles and materials with low release

Processes, tasks, activities covered	Industrial and Professional use of Aluminium salts in spraying formulations - solid - low dustiness . Includes equipment cleaning and maintenance.
GES exposure criteria	DNEL, inhalation long term: 1.8 mg/m3
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposure [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: **Use suitable eye protection [PPE26].** **Avoid skin contact: wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]**	
PROC1: General exposures (closed systems) [CS15]. Continuous process [CS54]. Process sampling [CS2] (closed systems) [CS107]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}.*
PROC2: General exposures [CS1]. Continuous process [CS54]. Process sampling [CS2] (open systems) [CS108]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}.*
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. ; With sample collection	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} ;* *{Drain down and flush system prior to equipment break-in*

[CS56]. Equipment cleaning and maintenance [CS39].	*or maintenance [E55]}.{Clear spills immediately [C&H13]}.*
PROC5: General exposures (open systems) [CS16]. Mixing operations (open systems) [CS30]. Material transfers [CS3]. ; Batch process [CS55]. ; Cleaning [CS47].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC7: General exposures [CS1]. Spraying [CS10].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8a: General exposures (open systems) [CS16]; Non-dedicated facility [CS82]; Material transfers [CS3]; Equipment cleaning and maintenance [CS39]; Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]; Dedicated facility[CS81] Material transfers [CS3] ; Equipment cleaning and maintenance [CS39]; Bulk transfers [CS14].	No specific measures identified [EI18]. {Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.
PROC9: General exposures [CS1] ; Dedicated facility [CS81] Drum and small package	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} .{Clean equipment and the work area every day [C&H3]}.{Clear spills immediately*

filling [CS6]; Equipment cleaning and maintenance [CS39].	*[C&H13]}.*
PROC11: General exposures [CS1]. Spraying [CS10].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]}. ; {Clear spills immediately [C&H13]}.*
PROC19: General exposures [CS1]. Mixing operations (open systems) [CS30]. Manual [CS34].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]}; {Clear spills immediately [C&H13]}*
Section 2.2	**Control of environmental exposure**

Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.

Section 3	**Exposure Estimation**

3.1. Health

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
1 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
2 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
5 -Mixing or blending in batch processes (multistage and/or significant contact)	1.000	5-25%	0.60	0.33
7 -Industrial spraying	1.000	5-25%	0.60	0.33
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.500	5-25%	0.30	0.17

9 -Transfer of chemicals into small containers (dedicated filling line)	0.500	5-25%	0.30	0.17
11 - Non industrial spraying	1.000	5-25%	0.60	0.33
19 - Hand-mixing with intimate contact (only PPE available	0.500	5-25%	0.30	0.17

3.2. Environment

N.A.

Section 4	**Guidance to check compliance with the Exposure Scenario**

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]

4.2. Environment

N.A.

Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.

Control of Worker Exposure	
Use of PPE	Skin protection: Gloves: - Observe breakthrough time of the gloves used Respiratory protection: Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES4 – Industrial and Professional use of Aluminium salts in non-spraying formulations – solid, low dustiness ; max. Aluminium content = 25%

Section 1	Exposure Scenario Title
Title	**Industrial and Professional use of Aluminium salts in non-spraying formulations - solid, low dustiness ; max. Aluminium content = 25%**
Use Descriptor	Sector of Use: SU1, SU5, SU6b, SU7, SU13, SU19
	Process Categories: PROC1: Use in a closed process, no likelihood of exposure PROC2: Use in a closed continuous process, with occasional controlled exposure PROC3: Use in a closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC6: Calendering operations PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10: Roller application or brushing PROC13: Treatment of articles by dipping and pouring PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelletization PROC15: Use as a laboratory reagent PROC19: Hand-mixing with intimate contact and only PPE available
	Environmental Release Categories: ERC2: Formulation of preparations ERC3: Formulation in materials ERC4: Industrial use ERC5: Industrial use resulting in inclusion into or onto a matrix ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b: Industrial use of reactive processing aids ERC8a: Wide dispersive indoor use of processing aids in open systems ERC8b: Wide dispersive indoor use of reactive substances in open systems ERC8c: Wide dispersive indoor use resulting in inclusion into

	or onto a matrix ERC8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC11a: Wide dispersive indoor use of long-life articles and materials with low release
Processes, tasks, activities covered	Industrial and Professional use of Aluminium salts in non-spraying formulations - solid - low dustiness . Includes equipment cleaning and maintenance.
GES exposure criteria	DNEL, inhalation long term: 1.8 mg/m3
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposure [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: **Use suitable eye protection [PPE26].** **Avoid skin contact: wear chemically resistant gloves (tested to EN374) in combination with specific activity training [PPE17]**	
PROC1: General exposures (closed systems) [CS15]. Continuous process [CS54]. Process sampling [CS2] (closed systems) [CS107]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}.*

PROC2: General exposures [CS1]. Continuous process [CS54]. Process sampling [CS2] (open systems) [CS108]	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}.*
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. ; With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed} ;* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clear spills immediately [C&H13]}.*
PROC4: General exposures (open systems) [CS16]. Batch process [CS55] (open systems) [CS108]; Drum/batch transfers [CS8]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}; {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. ;* *{Clear spills immediately [C&H13]}.*
PROC5: General exposures (open systems) [CS16]. Mixing operations (open systems) [CS30]. Material transfers [CS3]. ; Batch process [CS55]. ; Cleaning [CS47].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC6: General exposures (open systems) [CS16] Mixing operations (open	No specific measures identified [EI18]. *Recommendations: {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*

systems) [CS30]. Material transfers [CS3]. Batch process [CS55]. ; Cleaning [CS47]	
PROC8a: General exposures (open systems) [CS16]; Non-dedicated facility [CS82]; Material transfers [CS3]; Equipment cleaning and maintenance [CS39]; Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]; Dedicated facility [CS81] Material transfers [CS3]; Equipment cleaning and maintenance [CS39]; Bulk transfers [CS14].	No specific measures identified [EI18]. {Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.
PROC9: General exposures [CS1]; Dedicated facility [CS81] Drum and small package filling [CS6]; Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} .{Clean equipment and the work area every day [C&H3]}.{Clear spills immediately [C&H13]}.*
PROC10: General exposures (open systems) [CS16] Rolling, Brushing [CS51]. ; Equipment cleaning and maintenance [CS39]	No specific measures identified [EI18]. *Recommendations:* *{Use long handled tools where possible [E50]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}. {Avoid splashing [C&H15]}.*

PROC13: General exposures, open systems [CS16] Dipping, immersion and pouring [CS4]	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]} {Clear spills immediately [C&H13]}.*
PROC14: General exposures (open systems) [CS16] Production or preparation or articles by tabletting, compression, extrusion or pelletization [CS100]	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC15: General exposures [CS1]. Laboratory activities [CS36]. Small scale [CS61].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC19: General exposures [CS1]. Mixing operations (open systems) [CS30]. Manual [CS34].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]}. ;* *{Clear spills immediately [C&H13]}*
Section 2.2	**Control of environmental exposure**
Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.	
Section 3	**Exposure Estimation**

3.1. Health

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
1 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
2 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	0.500	5-25%	0.30	0.17
5 -Mixing or blending in batch processes (multistage and/or significant contact)	1.000	5-25%	0.60	0.33
6 -Calendering operations	1.000	5-25%	0.60	0.33
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.500	5-25%	0.30	0.17
9 -Transfer of chemicals into small containers (dedicated filling line)	0.500	5-25%	0.30	0.17
10 - Roller application or brushing	0.500	5-25%	0.30	0.17
13 -Treatment of articles by dipping and pouring	0.500	5-25%	0.30	0.17
14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation	1.000	5-25%	0.60	0.33
15 - Use of laboratory reagents in small scale laboratories	0.100	5-25%	0.06	0.03
19 - Hand-mixing with intimate contact (only PPE available	0.500	5-25%	0.30	0.17

3.2. Environment

N.A.

Section 4	**Guidance to check compliance with the Exposure Scenario**

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]

4.2. Environment

N.A.

Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.

Control of Worker Exposure	
Use of PPE	Skin protection: Gloves: - Observe breakthrough time of the gloves used Respiratory protection: Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES5 – Industrial and Professional use of Aluminium salts as flocculants or coagulant in water and waste water treatment; solid – low dustiness ; Aluminium content = max. 25%

Section 1	**Exposure Scenario Title**
Title	**Industrial and Professional use of Aluminium salts as flocculants or coagulant in water and waste water treatment; solid – low dustiness ; Aluminium content = max. 25%**
Use Descriptor	Sector of Use: SU2, SU5, SU6b, SU10, SU23)
	Process Categories: PROC2: Use in a closed continuous process, with occasional controlled exposure PROC3: Use in a closed batch process (synthesis or formulation) PROC4: Use in a batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC19: Hand-mixing with intimate contact and only PPE available
	Environmental Release Categories: ERC2: Formulation of preparations ERC4: Industrial use of processing aids and products, not becoming part of articles ERC6b: Industrial use of reactive processing aids ERC8a:Wide dispersive indoor use of processing aids in open systems ERC8b: Wide dispersive indoor use of reactive substances in open systems ERC8d: Wide dispersive outdoor use of processing aids in open systems
Processes, tasks, activities covered	Industrial and Professional use of Aluminium salts as flocculants or coagulant in water and waste water treatment.
GES exposure criteria	DNEL, inhalation long term: 1.8 mg/m3
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]

Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20oC above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. ; Ensure operatives are trained to minimize exposures [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: **Use suitable eye protection [PPE26].** **Avoid skin contact: wear suitable gloves tested to EN374 [PPE15]**	
PROC2: General exposures [CS1]. Continuous process [CS54]. Process sampling [CS2] (open systems) [CS108]	No specific measures identified [EI18]. *Recommendations* *{Ensure the system is closed} {Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}.*
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed}* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Clear spills immediately [C&H13]}.*
PROC4: General exposures (open systems) [CS16]. Batch process [CS55] (open systems) [CS108]; Drum/batch transfers [CS8]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}; {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}.{Clear spills immediately [C&H13]}.*

PROC5: General exposures (open systems) [CS16]. Mixing operations (open systems) [CS30]. Material transfers [CS3]. Batch process [CS55]. Cleaning [CS47].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}; {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8a: General exposures (open systems) [CS16]; Non-dedicated facility [CS82]; Material transfers [CS3]. Equipment cleaning and maintenance [CS39]. Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]. Dedicated facility [CS81] Material transfers [CS3]. Equipment cleaning and maintenance [CS39]. Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
PROC9: General exposures [CS1]; Dedicated facility [CS81]Drum and small package filling [CS6]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*

PROC19: General exposures [CS1]. Mixing operations (open systems) [CS30]. Manual [CS34].	No specific measures identified [EI18]. *Recommendations:* *{Clean equipment and the work area every day [C&H3]}. ;* *{Clear spills immediately [C&H13]}*

Section 2.2 Control of environmental exposure

Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.

Section 3 Exposure Estimation

3.1. Health

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
2 - Use in closed process, no likelihood of exposure	0.010	5-25%	0.01	0.00
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	0.500	5-25%	0.30	0.17
5 -Mixing or blending in batch processes (multistage and/or significant contact)	1.000	5-25%	0.60	0.33
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.500	5-25%	0.30	0.17
9 -Transfer of chemicals into small containers (dedicated filling line)	0.500	5-25%	0.30	0.17
19 - Hand-mixing with intimate contact (only PPE available	0.500	5-25%	0.30	0.17

3.2. Environment

N.A.

Section 4 Guidance to check compliance with the Exposure Scenario

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]	
4.2. Environment	
N.A.	
Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Use of PPE	<u>Skin protection:</u> Gloves: - Observe breakthrough time of the gloves used <u>Respiratory protection:</u> Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES6 - Use of Aluminium salts – solid, low dust – in industrial and professional laboratory settings; max Aluminium content = 25%

Section 1	**Exposure Scenario Title**
Title	**Use of Aluminium salts – solid, low dust – in industrial and professional laboratory settings; max Aluminium content = 25%**
Use Descriptors	Sector of Use: SU9
	Process Categories: PROC15: Use as a laboratory reagent
	Environmental Release Categories: ERC4: Industrial use of processing aids in processes and products, not becoming part of articles
Processes, tasks, activities covered	Use of aluminium salts (solid, low dustiness) in small scale laboratory settings. Max. aluminium content = 25%
Exposure criteria	DNEL, inhalation long term: 1.8 mg/m³
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between milliliters (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20oC above ambient [G15] Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposures [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: **Use suitable eye protection [PPE26]** **Avoid skin contact: Wear suitable gloves tested to EN374 [PPE15]**	
PROC15: General exposures [CS1]. Laboratory activities [CS36]. Small scale [CS61].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately*

	[C&H13]}.

Section 2.2	**Control of environmental exposure**

Aluminum, aluminum powders, aluminum oxide and soluble aluminum compounds are non hazardous (not classified for the environment). Aluminum (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminum to the existing natural pools of aluminum in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.

Section 3	**Exposure Estimation**

3.1. Health

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
15 - Use of laboratory reagents in small scale laboratories	0.100	5-25%	0.06	0.03

3.2. Environment

N.A.

Section 4	**Guidance to check compliance with the Exposure Scenario**

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]

4.2. Environment

N.A.

Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.

Control of Worker Exposure

Use of PPE	<u>Skin protection:</u> Gloves: - Observe breakthrough time of the gloves used <u>Respiratory protection:</u> Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day

ES7 - Use of Aluminium salts – solid – low dust; Aluminium content = max. 25% for the surface coating of titanium dioxide pigment

Section 1	**Exposure Scenario Title**
Title	**Use of Aluminium salts – solid – low dust; Aluminium content = max. 25% for the surface coating of titanium dioxide pigment**
Use Descriptor	Sector of Use: SU8, SU9
	Process Categories: PROC3: Use in a closed batch process (synthesis or formulation) PROC4: Use in a batch and other process (synthesis) where opportunity for exposure arises PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
	Environmental Release Categories: ERC1: Manufacture of substances
Processes, tasks, activities covered	Aluminium sulphate is reacted to form a surface coating on titanium dioxide by pH adjustment of aluminium sulphate solutions in the presence of a titanium dioxide slurry. Typically this is carried out as a batch reaction. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities
Exposure criteria	DNEL, inhalation long term: 1.8 mg/m³
Section 2	**Operational conditions and risk management measures**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Solid, low dustiness [OC1]
Concentration of substance in product	Covers percentage substance in the product up to 25% [G12].
Amounts used	Varies between millilitres (sampling) and cubic meters (material transfers) [OC13]
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	*Not applicable*
Other Operational Conditions affecting worker exposure	Assumes use at not > 20oC above ambient [G15] Assumes a good basic standard of occupational hygiene is implemented [G1]. Ensure operatives are trained to minimize exposures [EI19]
Contributing Scenarios	**Risk Management Measures**
Below pH2 and above pH11 the substance has corrosive properties: **Use suitable eye protection [PPE26]**	

Avoid skin contact: Wear suitable gloves tested to EN374 [PPE15]	
PROC3: General exposures [CS1]. Use in contained batch processes [CS37]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed}* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clear spills immediately [C&H13]}.*
PROC4: General exposures (open systems) [CS16]. Batch process [CS55] (open systems) [CS108]; Drum/batch transfers [CS8]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	No specific measures identified [EI18]. *Recommendations:* *{Ensure the system is closed};* *{Drain down and flush system prior to equipment break-in or maintenance [E55]}.{Clear spills immediately [C&H13]}.*
PROC8b: General exposures, open systems [CS16]. Dedicated facility [CS81] Material transfers [CS3]. Equipment cleaning and maintenance [CS39]. Bulk transfers [CS14].	No specific measures identified [EI18]. *Recommendations:* *{Drain down and flush system prior to equipment break-in or maintenance [E55]} {Use drum pumps [E53]}. {Clean equipment and the work area every day [C&H3]}. {Clear spills immediately [C&H13]}.*
Section 2.2	**Control of environmental exposure**
Aluminium, aluminium powders, aluminium oxide and soluble aluminium compounds are non hazardous (not classified for the environment). Aluminium (Al) is the most commonly occurring metallic element, comprising eight percent of the earth's crust and is therefore found in great abundance in both the terrestrial and sediment environments. Concentrations of 3-8% (30,000-80,000 ppm) are not uncommon. The relative contributions of anthropogenic aluminium to the existing natural pools of aluminium in soils and sediments is very small, and therefore, not relevant either in terms of added amounts or in terms of toxicity.	
Section 3	**Exposure Estimation**
3.1. Health	

Process Category	TRA Predicted Exposure - (mg/m3) - no modifiers	TRA concentration factor	Predicted Exposure - (mg/m3) - modified	Overall RCR (inhalation)
3 - Use in closed batch process (synthesis or formulation)	0.100	5-25%	0.06	0.03
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	0.500	5-25%	0.30	0.17
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	0.500	5-25%	0.30	0.17

3.2. Environment

N.A.

Section 4	**Guidance to check compliance with the Exposure Scenario**

4.1. Health

The ECETOC TRA (V2.0) tool has been used to estimate workplace exposures unless otherwise indicated [G21]

4.2. Environment

N.A.

Section 5	**Additional good practice advice beyond the REACH Chemical Safety Assessment**

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.

Control of Worker Exposure

Use of PPE	<u>Skin protection:</u> Gloves: - Observe breakthrough time of the gloves used <u>Respiratory protection:</u> Respirators: - Wear a disposable mask only once - Clean non-disposable masks after each use and store in a clean box in a clean area - Wear respirators ≤ 2 hrs/day