ID Card
Silver

Version 4 July 2023

Notes:

- *This ID card is used to support the substance sameness discussions and to describe the substance to the best of the members' knowledge.*
- *It also aims at grouping communications relevant to the request of available data or information.*
- *It is the responsibility of each individual registrant to identify their substance and to report company-specific identity in their Registration Dossier (section 1 of IUCLID).*

1. Identification of the substance

Table 1. Identification of the substance

	Original (in EC inventory)
Name	Silver
EC number	231-131-3
CAS number	7440-22-4
Description	Not available
Composition type	Mono-constituent substance

2. Synonyms and other identifiers of the substance

None

3. Substances (with core identifiers) also falling under this substance (with justification)

None

4. Information related to molecular and structural formula of the substance

Table 2. Information related to molecular and structural formula of the substance

Molecular formula	Ag
Structural formula	Ag
Smiles notation	[Ag]
Optical activity	Not applicable
Typical ratio of (stereo) isomers	Not applicable
Molecular Weight / Molecular Weight range	107,87 g/mol

5. Typical composition of the substance

Silver can be placed on the market in nanoforms, fine and coarse powders, and massive forms (e.g.: rods, wire, bars, etc.). Varying particle sizes may influence the classification. All forms of silver will be addressed in the same Registration Dossier but are reported individually in IUCLID section 1.2 and linked to the appropriate classification.

- Silver ≥ 99,9 % Ag in massive form (> 1 mm) – not classified

Table 3. Typical composition

	Name	Symbol / Formula	Typical concentration (range) (%)
Main constituent(s)*	Silver	Ag	≥ 99,9

* ≥ 80 % (w/w) for mono-constituent substances; ≥ 10 % (w/w) and < 80 % (w/w) for multi-constituent substances.

The composition given above is typical and should therefore represent the majority of Silver ≥ 99,9 % Ag in massive form (> 1 mm) as placed on the EEA market.

- Silver < 99,9 % Ag in massive form (> 1 mm) with no classified impurities – not classified

Table 4. Typical composition

	Name	Symbol / Formula	Typical concentration (range) (%)
Main constituent(s)*	Silver	Ag	≥ 80 - < 99,9
Impurity(ies)#	Several impurities which do not affect the classification of the substance	Au, PGM, Cu, Ni, Pb	> 0,1 - < 20

* ≥ 80 % (w/w) for mono-constituent substances; ≥ 10 % (w/w) and < 80 % (w/w) for multi-constituent substances.

An impurity is an unintended constituent present in a substance, as produced. It may originate from the starting materials or be the result of secondary or incomplete reactions during the production process. While impurities are present in the final substance, they were not intentionally added.

The composition given above is typical and should therefore represent the majority of Silver < 99,9 % Ag in massive form (> 1 mm) as placed on the EEA market.

- Silver ≥ 99,9 % Ag in powder form (< 1 mm but which does not fulfil the EU definition of nanomaterial) – classified for environmental hazard

Table 5. Typical composition

	Name	Symbol / Formula	Typical concentration (range) (%)
Main constituent(s)*	Silver	Ag	≥ 99,9

* ≥ 80 % (w/w) for mono-constituent substances; ≥ 10 % (w/w) and < 80 % (w/w) for multi-constituent substances.

The composition given above is typical and should therefore represent the majority of Silver ≥ 99,9 % Ag in powder form (< 1 mm) as placed on the EEA market.

- Silver < 99,9 % Ag in powder form (< 1 mm but which does not fulfil the EU definition of nanomaterial) with no classified impurities – classified for environmental hazard

Table 6. Typical composition

	Name	Symbol / Formula	Typical concentration (range) (%)
Main constituent(s)*	Silver	Ag	≥ 80 - < 99,9
Impurity(ies)#	Several impurities which do not affect the classification of the substance	Au, PGM, Cu, Ni, Pb	> 0,1 - < 20

* ≥ 80 % (w/w) for mono-constituent substances; ≥ 10 % (w/w) and < 80 % (w/w) for multi-constituent substances.

An impurity is an unintended constituent present in a substance, as produced. It may originate from the starting materials or be the result of secondary or incomplete reactions during the production process. While impurities are present in the final substance, they were not intentionally added.

The composition given above is typical and should therefore represent the majority of Silver < 99,9 % Ag in powder form (< 1 mm) as placed on the EEA market.

- Nano 34.2 - Silver in nanoform (≤ 100 nm) – classified for environmental and human health hazards

Table 7. Typical composition

	Name	Symbol / Formula	Typical concentration (range) (%)
Main constituent(s)*	Silver	Ag	≥ 90
Impurity(ies)#	Several impurities which do not affect the classification of the substance	Au, PGM, Cu, Ni, Pb	> 0,1 - < 10

* ≥ 80 % (w/w) for mono-constituent substances; ≥ 10 % (w/w) and < 80 % (w/w) for multi-constituent substances.

The silver REACH registration dossier covers 1 silver nanoform named 'Nano 34.2' in the technical dossier. The naming refers to the D50 of the particle size distribution and the coating.

The production of nano-sized powders of silver encompasses the reduction of a silver salt such as silver nitrate in deionised water with a reducing agent in the presence of colloidal stabilizer. For example, reducing agents like fructose, glucose, ethanol, ethylenglycol, polyvinylalcohol have been used with, for

example polyvinylpyrrolidone (PVP), citrate, cellulose, and other carbohydrates and fatty acids as stabilizing agents. These stabilising agents (preventing aggregation and agglomeration of particles of smaller size) may or may not be removed from the final silver powder product after production, depending on the further use conditions of the product. This results in so-called 'uncoated' or 'coated' powders, respectively. Some manufacturers supply the silver particles of smaller sizes in aqueous suspensions to ensure the physical dispersion of the particles; these should be considered as mixtures/preparations rather than as discrete forms of silver under REACH. Since detailed information on the coatings and solvent/suspension agents can be confidential to the individual registrants, more information is provided in the technical dossier section 1.4 provided by the individual registrants.

Based on the available information on the relative hazard and fate properties of the nanosilver form covered in the dossier, the silver REACH dossier is also considered to adequately address the properties of this nanosilver form.

6. Information on appearance, physical state and properties of the substance

Table 8. Appearance / physical state / properties of the solid substance

Physical state	Solid
Physical form*	Crystalline
Appearance	Grey-metallic powder or massive
Particle size**	Nanoform (D50 = 34 nm) / Fine powder / Coarse powder / Massive object
Does the substance contain 'bound water'?#	No
Does the substance contain 'crystallisation water'?#	No
Does the solid hydrolyse?##	No
Is the solid hygroscopic?§	No

* Crystalline form: solid material whose constituent atoms, molecules, or ions are arranged in an ordered pattern extending in all three spatial dimensions. Amorphous form: solid material whose constituent atoms, molecules, or ions are randomly arranged.

** Nanoform: for full definition of a nanomaterial, see https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H0614(01).. Fine powder: particles in the size range 100 – 2.500 nm. Coarse powder: particles in the size range 2.500 nm – 1 mm. Massive object: particles in the size range > 1 mm.

'Bound water': water molecules that are coordinated as bound ligands. 'Crystallisation water' or hydration water: water that occurs in crystals (necessary for the maintenance of crystalline properties) but which is not directly bound to the metal ion (a hydrate contains a definite % of crystallisation water e.g. CuSO4 x 5 H2O, an anhydride does not contain any water)

Hydrolysis: decomposition (cleavage of chemical bonds) by the addition of water.

§ Hygroscopic substance: readily attracts moisture from its surroundings in open air, through either absorption or adsorption. Cf. also water/moisture content in tables under section 5.

Table 9. Additional properties of Nano 34.2

Shape	spheroidal, spherical
Crystallinity	crystalline, face-centered cubic
Volume specific surface area	150 m2/cm3

7. Analytical data

Annex VI of REACH requires the registrant to describe the analytical methods and/or to provide the bibliographical references for the methods used for identification of the substance and, where appropriate, for the identification of impurities and additives. This information should be sufficient to allow the methods to be reproduced.

Table 10. Analytical methods for identification of the substance

Parameter / Method	Recommended for substance identification and sameness check	Applicable	Not applicable or not recommended
Elemental analysis			
ICP (ICP-MS or ICP-OES)	X		
Atomic absorption spectroscopy (AAS)		X	
Glow discharge mass spectrometry (GDMS)			X
Molecular analysis			
Infrared (IR) spectroscopy			X
Raman spectroscopy			X
Mineralogical analysis			
X-Ray Fluorescence (XRF)			X
X-Ray Diffraction (XRD)			X
Morphology and particle sizing			
Electron microscopy (SEM, TEM, REM)* #	X		
Laser diffraction* #	X		
Particle size by other means (e.g. sieve analysis)#			X
Surface area by N-BET* #	X		
Other			
Gravimetric weight loss analysis for determination of residual solvent and organics on the surface of the metal	X		

Thermal Gravimetric Analysis (TGA) will determine the same as above.			
KSCN titration for assay determination	X		
Field emission SEM for PSD and morphology determination of nano Ag	X		
Screen analyses for PSD determination of coarse powders	X		

* Analytical techniques particularly (but not exclusively) relevant for nanomaterials.

*The choice of the technique for particle size depends on the size of the material as manufactured/imported/placed on the market/used.

Please refer to the ECHA Guidance on Appendix for nanoforms applicable to the Guidance on Registration and Substance Identification (Version January 2022)

8. Lead Registrant

Aurubis AG (Germany) is the Lead Registrant for Silver. The EPMF will provide support to the Lead Registrant as laid down in the EPMF Agreement.

9. Scope of the Registration Dossier

The uses included in this Registration Dossier are listed on the EPMF website.