



ID Card Slimes and Sludges, precious metal refining

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Please note that discussions on the ID Cards are currently ongoing.
Should you need further information / detail, please contact info@epmf.be
The content of this ID Card may be adjusted as the Refinables Project develops.

Notes:

- This ID card is used to support the substance sameness discussions in SIEFs and to describe the substance/group to the best of the SIEF members' knowledge.
- It also aims at grouping communications relevant to the request of available data or information, the approval of the proposed Lead Registrant and the registration strategy with the SIEF.
- 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).

DISCLAIMER

The proper identification and characterisation of a substance or intermediate is the responsibility of each registering legal entity. All data and information contained in this document shall be treated by the receiving party (i) in full confidence with the adequate respect of any confidential and/or proprietary nature of such information and (ii) only in the framework of the purpose of agreeing on substance sameness, Lead Registrant and overall REACH Strategy for the concerned Substance under REACH (the 'Purpose'). The receiving party (and any representative) shall not be allowed to use or circulate any or all parts of this document for any other purpose than the Purpose, without the prior written consent of the European Precious Metals Federation (EPMF). The content provided in this document is given for the Purpose and as such, no guarantee or warranty whatsoever (expressed or implied) is given as to its accuracy, completeness, merchantability or fitness for any particular purpose which the receiving party may have. In any case, any use by the receiving party would be made at its sole risk and liability.

1. Identification of the group

Table 1. Identification of the group

	Proposed by EPMF Refiners Work Group	Original (in EC inventory)
Name	Slimes and Sludges, precious metal refining	Slimes and Sludges, precious metal refining
EC number	308-516-0	308-516-0
CAS number	98072-61-8	98072-61-8
Description	Dry or wet residues resulting from hydro-metallurgical and/or electrolysis processes used in the refining of precious metals. Slimes and sludges from precious metals refining generally contain precious and base metals, and insoluble inorganic compounds in varying concentrations.	None

N.B.: The description proposed above will be further detailed by EPMF for Registration purposes.

2. Synonyms and other identifiers of the group

- Slime, Cu/Ni free
- Slime, roasted Se-free
- Ag anode slime
- Slimes, Ag electrolysis
- Slimes, Au electrolysis
- Slimes, PGM refining



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

Although slimes and sludges resulting from other metals refining processes may be very similar to precious metals slimes and sludges, they are not listed here as they are covered by other consortia and must hence, not be registered using the same information or in the same Registration Dossier.

Table 2. Synonyms and similar/same substances belonging to the group

Name	EC number	CAS number	Description (EC inventory)
Residues, silver sludge-electrolysis zinc-pptd., precious metal-contg.	309-641-3	100656-52-8	The residue obtained by zinc precipitation of the material obtained during the recovery of palladium and platinum from the anode sludges of silver electrolysis. Composed primarily of palladium, platinum, rhenium and the oxides of iron and zinc.
Slimes and Sludges, copper pickling wastewater treatment	293-678-4	91081-71-9	Sludges formed by the precipitation of compounds of non-ferrous metals arising from the neutralizing during effluent treatment of wash waters and spent pickling acids used for the cleaning and removal of oxide from copper and copper alloys.
Leach residues, precious metal smelting scrap	309-770-5	100995-79-7	The residues obtained from the leaching of scrap and waste materials containing gold, iridium, osmium, palladium, platinum, rhenium, ruthenium or silver. Composed primarily of alumina and silica with traces of all of the precious metals.

N.B.: No registration dossier will be prepared by the EPMF for the materials listed in the above table. EPMF Members are recommended to register their material using the identifiers provided in Table 1, for which a dossier will be prepared by the EPMF.

4. Usual composition of the substance

Table 3. Usual composition

Type	Name of the element	Symbol	Species present	Typical concentration (%)	Concentration range (%)
Precious metals	Silver	Ag	Metallic, oxides, sulphates, sulphides, chlorides	16	0,1 - 84
	Gold	Au	Metallic, oxides, sulphides, chlorides	11	0 - 95
	Iridium	Ir	Metallic, oxides, sulphides, chlorides, chloro-complexes	1,1	0 - 13
	Palladium	Pd	Metallic, oxides, sulphides, chlorides, chloro-complexes	8	0 - 88
	Platinum	Pt	Metallic, oxides, sulphides, chlorides, chloro-complexes	5,3	0 - 60
	Rhodium	Rh	Metallic, oxides, hydroxides, sulphides, chlorides, chloro-complexes, nitro-complexes	2,6	0 - 21
	Ruthenium	Ru	Metallic, oxides, hydroxides, sulphides, chlorides, chloro-complexes	3,2	0 - 29



Other metals/ constituents	Aluminium	Al	Oxides	0,96	0 - 14
	Arsenic	As	Metallic, oxides, hydroxides, chlorides, sulphides	0,93	0 - 5,2
	Boron	B	Oxides	0,002	0 - 0,01
	Barium	Ba	Oxides, hydroxides, chlorides, sulphates	0,96	0 - 16
	Bismuth	Bi	Metallic, oxides, hydroxides, chlorides, sulphides	1,1	0 - 9,2
	Carbon	C		0,48	0 - 8
	Calcium	Ca	Oxides, hydroxides, chlorides, sulphates	0,66	0 - 10
	Cadmium	Cd	Chlorides, oxides	0,02	0 - 0,2
	Cerium	Ce	Chlorides, oxides	0,05	0 - 1
	Chlorine	Cl	Chlorides, chloro-complexes	10	0 - 60
	Cobalt	Co	Oxides, hydroxides, chlorides	0,18	0 - 3,7
	Chromium	Cr	Metallic, oxide (Cr ₂ O ₃), hydroxide, chloride	1,2	0 - 20
	Copper	Cu	Metallic, oxides, hydroxides, chlorides, sulphides	5,7	0 - 33
	Iron	Fe	Metallic, oxides, chlorides, sulphides, sulphates	4,3	0 - 40
	Potassium	K	Chlorides, oxides	0,67	0 - 17
	Magnesium	Mg	Chlorides, oxides	0,13	0 - 3
	Manganese	Mn	Chlorides, oxides	0,03	0 - 0,5
	Sodium	Na	Chlorides, oxides	1,1	0 - 15
	Nickel	Ni	Metallic, oxides, hydroxides, sulphides, chlorides	1	0 - 10
	Lead	Pb	Metallic, oxides, hydroxides, sulphates, chlorides	2,3	0 - 14
	Sulphur	S	Sulphates, sulphides	1,5	0 - 26
	Antimony	Sb	Metallic, oxides, hydroxides, chlorides	0,65	0 - 8
	Selenium	Se	Metallic, oxides	4	0 - 30
	Silicon	Si	Oxides	1,5	0 - 13
	Tin	Sn	Metallic, oxides, hydroxides, chlorides	0,56	0 - 5
	Tellurium	Te	Metallic, oxides, hydroxides, telluric acid, sulphides	2,3	0 - 25
Titanium	Ti	Oxide	0,17	0 - 4	
Zinc	Zn	Oxides, chlorides, sulphides	0,33	0 - 4,5	
Zirconium	Zr	Oxide	0,28	0 - 5	
Total			90		

N.B.1: Classification drivers are indicated in red (see also Table 7).

Metal species were determined based on information available to registrants and/or mineralogical analysis (by means of XRD analysis).

The composition given above represents the usual elemental/compound content available to the Members of the EPMF by 28 February 2014. This usual content represents the majority of the Slimes and Sludges, precious metal refining that is placed on the EEA market.

In a UVCB substance, the number of constituents is relatively large and/or; the composition is, to a significant part, unknown and/or; the variability of composition is relatively large or poorly predictable. Hence, concentration ranges outside the ones given above do not exclude sameness and are usually referred to as unusual or exceptional situations. Each potential registrant is responsible for performing its own elemental analysis.



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

Table 4. Appearance / physical state / properties of the substance

Physical state	Solid
Appearance	Grey-black
Particle size*	Powder

* 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.

6. 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.

In addition to analytical data, all registrants should use expert judgment and process knowledge to characterize their substance.

Table 5. 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)			
Glow discharge mass spectrometry (GDMS)			
Molecular analysis			
Infrared (IR) spectroscopy			
Raman spectroscopy			
Mineralogical analysis			
X-Ray Fluorescence (XRF)			
X-Ray Diffraction (XRD)	X		
Morphology and particle sizing			
Optical microscopy and electron microscopy (SEM, TEM, REM)* #	X		
Laser diffraction* #			
Particle size by other means (e.g. sieve analysis)#			
Surface area by N-BET* #			
Other			
Magnetite analyser		X	
S/C analyzer		X	
Separation technique: ion exchange chromatography		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.



7. Lead Registrant

Aurubis AG (Germany) volunteers to be the Lead Registrant for this intermediate. The European Precious Metals Federation (EPMF) will provide support to the Lead Registrant as laid down in the EPMF Agreement.

8. REACH Strategy

The table below presents the overall Registration Strategy for Slimes and Sludges, precious metal refining based on the information available to the EPMF by the date given above on the document.

The Registration Dossier will be prepared for the highest substance status (information requirements associated to a substance or Article 10 Registration being higher than an intermediate handled under strictly controlled conditions or Article 17 or 18 one) and associated tonnage band.

The recap below therefore reflects the scope of work of the EPMF for Slimes and Sludges, precious metal refining and sets the minimum and maximum set of information that will be gathered and/or produced when preparing the Registration Dossier for Slimes and Sludges, precious metal refining as described in this ID Card.

If higher information requirements are necessary, these can be included in the Registration dossier (if EPMF is made aware of these additional requirements in-time) as an update to the already submitted dossier.

Table 6. REACH strategy for the group (basis for REACH Registration preparation)

Item	Description	Comment
SIEF	As pre-registered	
REACH category	UVCB	The composition of slimes and sludges will depend on the process they result from; the selection of the analytical technique will depend on the nature of the constituent(s) dominating the composition. Part of the composition can remain unknown if the (combination of) analytical technique(s) used to determine the composition is not fully suitable to identify all types of constituents. The variability of the composition of slimes and sludges both intra- and inter-registrants is large as slimes and sludges can result from various process steps having each its specific and potentially different feed material and reaction conditions. Slimes and sludges are truly substances of variable and partially unknown composition.
Highest status	Non-SCC intermediate	At least one Member of the EPMF has declared this material as an intermediate not handled under strictly controlled conditions (SCC), meaning an Article 10 dossier is required for joint submission.



Intermediate status		Slimes and sludges are the result of <u>intentional</u> hydro-metallurgical processes to produce (precious) metals via a number of reduction steps. Slimes and sludges are produced during the precious metals refining processes and may contain significant quantities of valuable metals in which case they are used as feed material and <u>chemically transformed</u> to recover valuable metals contained in them e.g. in further smelting processes.
Highest tonnage band	> 1000 t/a	
Information requirements	Available / Existing + Annex VII – VIII – IX - X	
Existing classification	See Table 7	Classifications for Slimes and Sludges, precious metal refining are proposed in Table 7 as grouped classifications based on cluster analysis and expert judgement. This is proposed for very large and variable groups, where many combinations are possible and hence there was a need to apply cluster analysis to identify conservative classification profiles to arrive at a reasonable number of possible classifications for the individual streams belonging to the UVCB substance. Compositions or triggers associated to each classification provide a non-exhaustive list of those constituents which can be present in the Refinable.
Registration deadline	2010	Slimes and Sludges, precious metal refining was registered as an SCC intermediate in 2010 (Article 17/18 dossier) and will be updated to a full substance registration (Article 10 dossier) in 2014

Table 7. Classification for the group

	Classification CLP	Composition / classification drivers
1	ENV Ac 1, ENV Ch 1	<p>%NiCl₂ < 0,01%; %Sb₂O₃ < 1%; %Pb < 0,05%; %Co < 0,1%; %CdCl₂ < 0,1%; %As₂O₃ < 0,1% %Na₂B₄O₇ < 5,5%; %Se comp < 10%; %MnO₂ < 10%</p> <p>%H₂SO₄/5% + %As₂O₃/1% + %NiCl₂/10% + %CaO/10% < 1 %H₂SO₄/5% + %As₂O₃/1% + %CaO/1% + %Pd comp/10% + %Na₂BO₇/10% < 1</p> <p>100 / ((%As₂O₃)/5 + (%Se comp + %Te/Te comp + %CdCl₂)/100 + (%BaO₂ + %Co + %CuSO₄ + %Pb comp + %NiSO₄ + %NiCl₂ + %ZnSO₄ + %Cu₂O + %MnO₂ + %Pd comp)/500) > 2000 mg/kg</p> <p>100 / ((%CdO + %CdCl₂)/100 + (%Se comp)/700 + (%BaO₂ + %Pb comp + %NiSO₄ + %NiCl₂ + %MnO₂ + %BaO₂)/4500 > 5 mg/L</p> <p>(%As₂O₃ + %CdO x 10 + %CoO x 10 + %Cu₂O + %Pb comp x 10 + %Se comp x 10 + %ZnO + %Ag comp x 1000 + %Au comp + %Pd comp x 10 + %Pt comp x 10 + %Ti comp + %Rh comp + %Ru comp + %CuSO₄ x 10 + %NiSO₄ + %ZnSO₄) > 25% *</p> <p>(%As₂O₃ + %CdO x 100 + %CoO x 10 + %Cu₂O + %Pb comp + %Se comp + %ZnO + %Ag comp x 100 + %Au comp + %Pd comp x 10 + %Pt comp + %Ti comp + %Rh comp + %Ru comp + %CuSO₄ + %NiSO₄ + %ZnSO₄) > 25% *</p>



<p>2 (Low Ni, As, Pb)</p>	<p>ENV Ac 1, ENV Ch 1, Acute tox oral 4, Skin sens 1</p>	<p>%NiCl₂: 0,01% - 0,1%; %Sb₂O₃ < 1%; %Pb < 0,05%; %Co < 0,1%; %CdCl₂ < 0,1%; %As₂O₃ < 0,1% %Na₂B₄O₇ < 5,5%; %Se comp < 10%; %MnO₂ < 10%</p> <p>$\frac{\%H_2SO_4/5\% + \%As_2O_3/1\% + \%NiCl_2/10\% + \%CaO/10\%}{100} < 1$ $\frac{\%H_2SO_4/5\% + \%As_2O_3/1\% + \%CaO/1\% + \%Pd\ comp/10\% + \%Na_2BO_7/10\%}{100} < 1$</p> <p>$100 / ((\%As_2O_3)/5 + (\%Se\ comp + \%Te/Te\ comp + \%CdCl_2)/100 + (\%BaO_2 + \%Co + \%CuSO_4 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%ZnSO_4 + \%Cu_2O + \%MnO_2 + \%Pd\ comp)/500)$ between 300 - 2000 mg/kg</p> <p>$100 / ((\%CdO + \%CdCl_2)/100 + (\%Se\ comp)/700 + (\%BaO_2 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%MnO_2 + \%BaO_2)/4500) > 5\ mg/L$</p> <p>$(\%As_2O_3 + \%CdO \times 10 + \%CoO \times 10 + \%Cu_2O + \%Pb\ comp \times 10 + \%Se\ comp \times 10 + \%ZnO + \%Ag\ comp \times 1000 + \%Au\ comp + \%Pd\ comp \times 10 + \%Pt\ comp \times 10 + \%Ti\ comp + \%Rh\ comp + \%Ru\ comp + \%CuSO_4 \times 10 + \%NiSO_4 + \%ZnSO_4) > 25\% *$ $(\%As_2O_3 + \%CdO \times 100 + \%CoO \times 10 + \%Cu_2O + \%Pb\ comp + \%Se\ comp + \%ZnO + \%Ag\ comp \times 100 + \%Au\ comp + \%Pd\ comp \times 10 + \%Pt\ comp + \%Ti\ comp + \%Rh\ comp + \%Ru\ comp + \%CuSO_4 + \%NiSO_4 + \%ZnSO_4) > 25\% *$</p>
<p>3 (Med Ni, As, Pb)</p>	<p>ENV Ac 1, ENV Ch 1, Acute tox oral 4, Acute tox inh 4, Skin 2, Eye dam. 2, Resp/skin sens 1, Muta 2, Carc. 1A, STOT Rep 1 (driver: NiCl₂ or Pb comp)</p>	<p>%Co >= 1% or %NiCl₂: 1%-10% %CdCl₂ < 0,1%; %Pb < 0,3%;</p> <p>$\frac{\%H_2SO_4/15\% + \%As_2O_3/5\%}{100} < 1$ $\frac{\%H_2SO_4/5\% + \%As_2O_3/1\% + \%NiCl_2/10\% + \%CaO/10\%}{100} >= 1$ $\frac{\%H_2SO_4/15\% + \%As_2O_3/3\% + \%CaO/3\%}{100} < 1$ $\frac{\%H_2SO_4/5\% + \%As_2O_3/1\% + \%CaO/1\% + \%Pd\ comp/10\% + \%Na_2BO_7/10\%}{100} >= 1$</p> <p>$100 / ((\%As_2O_3)/5 + (\%Se\ comp + \%Te/Te\ comp + \%CdCl_2)/100 + (\%BaO_2 + \%Co + \%CuSO_4 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%ZnSO_4 + \%Cu_2O + \%MnO_2 + \%Pd\ comp)/500)$ between 300 - 2000 mg/kg</p> <p>$100 / ((\%CdO + \%CdCl_2)/100 + (\%Se\ comp)/700 + (\%BaO_2 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%MnO_2 + \%BaO_2)/4500)$ between 1 and 5 mg/L</p>
<p>4 (High Ni, As, Pb)</p>	<p>Acute tox oral 3, Acute tox inh 4, Skin corr 1A, Eye dam. 1, Resp/skin 1, Muta 1B, Carc. 1A, Repro. 1A, STOT Rep 1 (driver: Pb comp), ENV Ac 1, ENV Ch 1</p>	<p>%NiCl₂ >= 1%; %CdCl₂ > 0,1%; %Pb >= 0,3%;</p> <p>$\frac{\%H_2SO_4/15\% + \%As_2O_3/5\%}{100} >= 1$</p> <p>$100 / ((\%As_2O_3)/5 + (\%Se\ comp + \%Te/Te\ comp + \%CdCl_2)/100 + (\%BaO_2 + \%Co + \%CuSO_4 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%ZnSO_4 + \%Cu_2O + \%MnO_2 + \%Pd\ comp)/500)$ between 50 - 300 mg/kg</p> <p>$100 / ((\%CdO + \%CdCl_2)/100 + (\%Se\ comp)/700 + (\%BaO_2 + \%Pb\ comp + \%NiSO_4 + \%NiCl_2 + \%MnO_2 + \%BaO_2)/4500)$ between 1 and 5 mg/L</p>

N.B.1: Classification drivers are (worst-case) assumptions and do not necessarily represent real species/mineralogical composition

N.B.2: Classification groups 3 and 4 have a CMR profile

9. Scope of the Registration Dossier

The uses included in this Registration Dossier are summarised in the table below and accompanied with the appropriate text.



Table 8. Reported uses of the substance

Description of use	Sector of Use (SU)	Process Category (PROC)	Environmental Release Category (ERC)
Manufacture of an intermediate	NA	<ul style="list-style-type: none">• PROC 1: Use in closed process, no likelihood of exposure• PROC 2: Use in closed, continuous process with occasional controlled exposure• PROC 3: Use in closed batch process (synthesis or formulation)• PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises• PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)• PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities• PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)• PROC 15: Use as laboratory reagent• PROC 21: Low energy manipulation of substances bound in materials and/or articles• PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting• PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature• PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles• PROC 26: Handling of solid inorganic substances at ambient temperature• PROC 27b: Production of metal powders (wet processes)	<ul style="list-style-type: none">• ERC 1: Manufacture of substances



Description of use	Sector of Use (SU)	Process Category (PROC)	Environmental Release Category (ERC)
Use as an intermediate in metal manufacturing	<ul style="list-style-type: none">• SU 14: Manufacture of basic metals, including alloys	<ul style="list-style-type: none">• PROC 1: Use in closed process, no likelihood of exposure• PROC 2: Use in closed, continuous process with occasional controlled exposure• PROC 3: Use in closed batch process (synthesis or formulation)• PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises• PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)• PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities• PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)• PROC 15: Use as laboratory reagent• PROC 21: Low energy manipulation of substances bound in materials and/or articles• PROC 22: Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting• PROC 23: Open processing and transfer operations with minerals/metals at elevated temperature• PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles• PROC 26: Handling of solid inorganic substances at ambient temperature• PROC 27b: Production of metal powders (wet processes)	<ul style="list-style-type: none">• ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates)