PM Refinables – Proposal to split Slimes & sludges, PM refining

The proposed criterion to split these is a combination of the **process** they originate from (e.g. slimes and sludges from hydro-metallurgical processes, slimes and sludges from wet treatment of by-products produced during melting processes) and the **PM refining** (Ag/Au/PGM refining) they result from.

It is noted that we need to distinguish between:

1) slimes and sludges from non-PM refining used as input in PM refining and covered in another registration;
2) the true PM refining slimes and sludges;
3) slimes and sludges obtained from hydro-metallurgical processes in order to concentrate the PM and used as input in PM refining.

Borderline cases:

- Some slimes and sludges from other sectors are subject to pre-treatments during which they are chemically modified and are considered as PM refining slimes and sludges after they are treated as part of a PM operation
- Slimes and sludges typically originate from wet processes. Pyro-metallurgical processes do not generate slimes and sludges, some of the residues of pyro-metallurgical processes can however be leached as part of a PM operation and then become a PM refining slime and sludge (i.e. after pre-treatment).

➔ **Consider one group per process and PM family (Ag, Au, and PGM) and possibly an additional group to cover borderline slimes and sludges.**

Based on the data submitted by PM Refiners in Summer 2009 (after grouping of PM Refinables as per registration), below table of production processes and sources for slimes & sludges was produced.

Company code	General description of production process	Source	Proposed sub-group
2	Slimes - Dried slimes (or roasted slimes)	Products with high PM content from primary and secondary sources	1. Slimes obtained as reaction by-product during pyro- or hydro-metallurgical concentration/upgrading of PM containing materials
1	Roasted, dried slime (Se-free) from PM refining	Products with high PM content from primary and secondary sources	
1	Intermediate after Cu and Ni leaching	Products with high PM content from primary and secondary sources	
	PGM Smelting feedstock	Concentrate high in PGMs used in Smelting from Primary and Secondary Sources	
3	Reaction byproducts obtained by hydrometallurgical PM upgrading operations	Base metals with medium (>1%) PM content	
8	Residue from hydrometallurgical upgrading processes	Residue with mixed PM content from primary and secondary sources	
2	Pd concentrate (Pd-slime) (Palladium)	Products with high PM content from primary and secondary sources	
	PM bearing refinables as powder, sludge, suspension or solution	Intermediates during refining of primary and secondary sources	
	Residues obtained in the late stages of PGM refining	Feed to PM refinery (doré, Fe bullion) (>90% PM)	

	PGM enriched feedstock for thermal process prior to smelting	Secondary sources of PGMs with a high calorific value, generally catalysts	
	Leach residues originating from main smelting process	Smelting of Products with high PM content from primary and secondary sources,	
	Leach residues originating from other streams eg, flue dust,catch pit & drain cleanings		
5	Slime from wet dedusting system of the process gases from the Kaldo furnace. After leaching of Se with NaOH, the slime is reversed to Kaldo furnace.	Product with high lead, silver and selenium content from primary sources	
7	Pyrometallurgical operations	Secondary PGM refinery	
5	Slimes obtained during Ag electrolytic refining and next leached with HCl solution (Raw Au slime, Au slime after pre-leaching)	Products with high Ag and Au content from primary sources	2. Slimes obtained during the electrolytic refining of Ag
2	Anode slime (after Ag-electrolysis)	Products with high PM content from primary and secondary sources	
1	Slime collected on bottom of Ag electrolysis	Products with high PM content from primary and secondary sources	
4	Ag electrolytic refining	Ag anodes, Solution of Ag nitrate and nitric acid	
4	Au electrolytic refining	Au anodes, Solution of AuCl3 and HCl	3. Slimes obtained during the electrolytic refining of Au
	Leach Residues dissolved in Hydrochloric acid	Liquor resulting from the dissolution of leach residues in hydrochloric acid	4. Slimes obtained during hydro-metallurgical/leaching processes of PM containing materials
	Leach residues from the PM plant / Precipitates from PM bearing solutions.	Products with high PM content from primary and secondary sources	
	Residues obtained by the addition of a reductant (aluminium, Zn, Cu, …) to end liquors of the refining of PMs	Wastewaters from various PM refining steps	
	Residue out of alkaline or acidic chemical reductions of pm bearing solutions	Products with PM content from primary and secondary sources	
6	Refinery solutions treatment: neutralization, precipitation of oxyde/hydroxyde of metals, sulfuration of metals not hydrolyzed, filtration in press-filter, drying of filter cake.	Products with low PM content	
2	Filtered precipitate from Au leaching to furnace (AgCl precipitate)	Product of PM refining process	
3	Residues obtained from the leaching of scrap and waste materials containing PMs.	Recycled PM materials	
	Leach residues originating from recycled refractories	Bricks, pots and crucibles crushed after end of life to recover PGMs	
	Dissolution residue out of acidic, neutral or alkaline leaching or dissolution steps of PM bearing	Products with PM content from primary and secondary sources sources	

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	materials		
7	Residues from hydrometallurgical processes entering PGM refining processes	Originating from base metal and silver refining processes	
7	Sludges and solutions produced during hydrochloric acid treatment of PGM containing materials	PGM Refining operations	
	Base metal hydroxydes precipitation from liquid effluents, Residues obtained by addition of reducing agent to the effluent stream of a PM refinery	Reaction by-product obtained by hydrometallurgical PM upgrading operations	5. Slimes obtained during treatment of production effluents of PM production processes
	Slime obtained by neutralization of waste water with milk of lime (Cu pickling wastewater treatment/ Slime from WWTP from PM production)	Product of the neutralization of the waste water from the PM Plant	
6	All the residues obtained from refining of PM.	Products with low PM content	6. Other slimes and sludges generated as by-products during PM production processes
	All solid PM materials not covered with 308-516-0 or 309-770-5	Intermediates during refining of primary and secondary sources	

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