PM Refinables – (non-)waste, intermediate, and UVCB status

12 December 2012

In order to provide evidence on the non-waste, intermediate, and UVCB status of the PM Refinables, the PMC secretariat drafted the below table for comments by the lead registrants in a first commenting round and by the co-registrants in a second commenting round.

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
1	**Doré**	Metallic bars/ingots, grains or anodes and their residues (spent anodes) resulting from pyro-metallurgy processes applied on primary and secondary feeds with high precious metal content. Doré mainly contains silver and/or gold and copper, lower quantities of platinum group metals (iridium, osmium, palladium, platinum, rhodium, and ruthenium) and other non-ferrous metals in varying concentrations.	Doré is not a waste in that it is not a substance which the holder discards or intends/is required to discard. It is an essential intermediary step in the processes aimed at producing pure forms of precious metals.	Doré is intentionally manufactured to be chemically transformed into another substance. A specific smelting process is designed to produce doré, which is further refined to produce pure silver or gold metal. It is hence truly an in-process intermediate in the production of pure precious metals. If it is handled under strictly controlled conditions an Article 17 or 18 dossier is required; if it is not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of doré is metallic, and can hence easily be fully determined by the applicable analytical technique. The variability of the composition of doré both intra- and inter-registrants is large as: The doré manufactured via a specific smelting process will be influenced by the variability of the feed material smelted to produce doré. Doré is truly a substance of variable composition.	Aurubis AG
2	**Precious metal matte**	Substance resulting from the smelting of precious metals and its alloys obtained from primary and secondary sources and including recycled plant intermediates. Precious metal matte is composed primarily of base metal sulphides containing precious metals and may contain other residual non-ferrous metals and their compounds in varying concentrations.	Matte is not a waste in that it is not a substance which the holder discards or intends to discard. It is an essential intermediary step in the processes aimed at producing pure forms of precious metals.	Matte is intentionally manufactured to be chemically transformed into another substance. A specific smelting process is designed to produce matte, which is further smelted/converted to produce pure precious metal. It is hence truly an in-process intermediate in the production of pure precious metals. If it is handled under strictly controlled conditions an Article 17 or 18 dossier is required; if it is not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of matte is sulphidic, and can hence easily be fully determined by the applicable analytical technique. The variability of the composition of matte both intra- and inter-registrants is large as matte manufactured via a specific smelting process will be influenced by the variability of the feed material smelted to produce matte. Matte is truly a substance of variable composition.	Umicore PMR

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
3	**Slags**	Heterogeneous solids (e.g.: lumps) resulting from pyro-metallurgy processes applied on precious metals containing-primary and secondary feeds, using several fluxing agents such as sodium borate or borax, sodium carbonate, sodium phosphate, silica, and aluminium silicate amongst others. Depending on the fluxing agent used, slags resulting from the refining of precious metals may contain ferrous and non-ferrous metal oxides, carbonates, phosphates, silicates, and/or fused salts in varying concentrations, with some quantities of precious metals.	Slags may or may not be discarded or intended to be discarded by the holder (and hence may or may not be considered as waste). If slags contain valuable contents of precious metals, they will not normally be discarded but used as feed material in the pyro-metallurgical production of precious metals. If slags are depleted of all valuable constituents they may be discarded or intended to be discarded (and hence be wastes). If in addition they are depleted of leachable or bio-available forms of hazardous constituents[1], they may be used, together with non-hazardous slags resulting from the production of other non-ferrous metals, as non-hazardous aggregate (e.g. as road fill), in which case they are non-wastes.	Slags are the result of intentional pyro-metallurgical processes to produce (precious) metals via a number of reduction steps. Slags serve as a collector of impurities in varying forms (depending on whether or not a flux is used and on the type of flux used) to separate these from the main source of (precious) metals in order to contribute to the concentration and purification of these. When the slag contains valuable contents of precious metals they are fed back into the pyro-metallurgical processes to be chemically transformed in order to recover the valuable metal content. • Slags can be regarded as a by-product[2] or side-stream of (precious) metal refining processes. By-products that are not imported or placed on the market (and are only used on-site) are exempt from registration according to Annex V of the REACH regulation. • When slags are not kept on-site but transported to another site where they will be chemically transformed, they can be regarded as transported isolated intermediates. If they are	The composition of slags will depend on the flux used; the selection of the analytical technique will depend on whether the composition is dominated by oxides, carbonates, phosphates, silicates, etc. 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 slags both intra- and inter-registrants is very large as slags can result from various process steps having each its specific and potentially different feed material and flux. Slags are truly substances of very variable and partially unknown composition.	Umicore PMR

[1] It is assumed that materials going to landfill / used as aggregate have always been depleted of metal content to levels below required levels and/or which are deemed to be leachable and/or bio-available.

[2] A by-product is a material that is not deliberately produced in a production process and that meets the following conditions:
- Further use of the substance or object is certain;
- The substance or object can be used directly without any further processing other than normal industrial practice;
- The substance or object is produced as an integral part of a production process; and
- Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental & health-protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

By-products are regarded by definition as non-waste.

				handled under strictly controlled conditions an Article 18 dossier is required; if they are not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead. • When they are transported to be used as aggregate (e.g. as road fill), they cannot be regarded as by-product or intermediate but as a substance and hence a full Article 10 (substance) dossier will be required. • If the slag is used both as a transported isolated intermediate and a substance, an Article 10 (substance) dossier will be required, but the quantity of slag used as intermediate and substance will need to be specified in the dossier. This is not only a requirement in the latest version of IUCLID 5 but also recommended to allow an informed assessment of the most efficient RMO in the event the slag used as substance is classified and can be considered to be a SVHC potentially subject to e.g. Authorisation or restriction under REACH.		

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
4	**Slimes and sludges**	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.	Slimes and sludges containing precious metals are generally not to be discarded by the holder (and hence are not to be considered as waste). Slimes and sludges contain valuable contents of (precious) metals and are used as intermediate step in the hydro-metallurgical and/or electrolysis processes and/or pyro-metallurgical production of (precious) metals.	Slimes and sludges are the result of intentional 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 chemically transformed to recover valuable metals contained in them e.g. in further smelting processes. • Slimes and sludges can be regarded as a by-product[3] or side-stream of (precious) metal refining processes. By-products that are not imported or placed on the market (and are only used on-site) are exempt from registration according to Annex V of the REACH regulation. • When slimes and sludges are not kept on-site but transported to another site where they will be chemically transformed, they can be regarded as transported isolated intermediates. If they are handled under strictly controlled conditions an Article 18 dossier is required; if they are not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	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 very 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 very variable and partially unknown composition.	Aurubis AG

[3] A by-product is a material that is not deliberately produced in a production process and that meets the following conditions:
- Further use of the substance or object is certain;
- The substance or object can be used directly without any further processing other than normal industrial practice;
- The substance or object is produced as an integral part of a production process; and
- Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental & health-protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

By-products are regarded by definition as non-waste.

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
5.1	**Leaching residues from copper-iron-lead-nickel matte leaching**	Dry or wet insoluble residues resulting from successive sulfuric acid-based leaching and/or pyro-metallurgical processes applied on primary and secondary streams resulting from the refining of copper, nickel and other base metals-containing ores and concentrates. Residues from copper-iron-lead-nickel matte leaching mainly contain precious and base metals such as copper, nickel and iron in metallic, sulphate, hydroxide and other mineral forms in varying concentrations.	Although their name may suggest these are wastes, leaching residues containing precious metals are not to be discarded by the holder (and hence are not wastes) but instead, an essential intermediary step in the processes aimed at producing pure forms of precious metals.	Leaching residues are intentionally manufactured to be chemically transformed into another substance. Dedicated hydro-metallurgical processes are designed to leach (precious) metal rich streams to produce (precious) metals via a number of reduction steps and further recover the valuable metal content from the leaching products. These are hence true in-process intermediates in the production of pure precious metals. If they are handled under strictly controlled conditions an Article 17 or 18 dossier is required; if they are not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of leaching residues will depend on the mineral source they originate from and the pre-treatment they have been subject to; 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 leaching residues both intra- and inter-registrants is not excessively large as they originate from a limited number of mineralogical sources. Leaching residues are truly substances of variable and partially unknown composition.	Umicore PMR
5.2	**Residues from copper speiss leaching**	Dry or wet insoluble residues resulting from leaching processes applied on copper speiss resulting from refining of primary and secondary copper feeds. Residues from copper speiss leaching mainly contain precious and base metal (e.g.: copper, lead, nickel) sulfo-arsenides complexes in varying concentrations.				Umicore PMR

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
6.1	**Electrolyte from silver electrolysis**	Fresh or spent aqueous silver nitrate solution used in and resulting from the electrolytic refining of silver. This electrolyte is constituted of silver nitrate, copper dinitrate, nitric acid, and it may contain some other metallic and non-metallic ions in varying concentrations, which will vary depending on the nature and composition of the primary or secondary raw material from which silver is recovered.	Electrolytes, whether fresh or spent, are not discarded or intended to be discarded by the holder, and hence are not wastes.	Fresh electrolyte is intentionally manufactured to be chemically transformed during the chemical reaction occurring during the electrolytic refining of precious metal anodes. Depending on their charge of precious metals and other impurities, spent electrolytes are chemically transformed to recover silver (e.g. through cementation) or recover gold and platinum group metals through hydrometallurgical processes (e.g. selective reduction and precipitation from solutions) Whether fresh or spent, an electrolyte fulfills the definition of an intermediate under REACH. If it is handled under strictly controlled conditions an Article 17 or 18 dossier is required; if it is not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of electrolytes is very specific in its fresh state, and becomes more unknown and variable after use, as it accumulates a number of impurities during electrolytic refining. It can easily be fully determined by the applicable analytical technique. The variability of the composition of fresh electrolytes both intra- and inter-registrants is relatively low but once used/spent, it will be influenced by the purity of the anode which depends on the composition of the original feed material used to produce the anode Electrolytes, especially in their used or spent form, are truly substances of variable but relatively well known composition.	KGHM Polska Miedz S.A.
6.2	**Electrolyte from gold electrolysis**	Fresh or spent aqueous gold trichloride solution used in and resulting from the electrolytic refining of gold. This electrolyte is constituted of gold trichloride, clorhidric acid, and it may contain some other metallic and non-metallic ions in varying concentrations, which will vary depending on the nature and composition of the primary or secondary raw material from which gold is recovered.				Aurubis AG

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
7	**Flue dust**	Dust collected from high temperature treatments and processes applied on primary and secondary feeds with a range of precious metal contents. Flue dusts mainly contain metal oxides, hydroxides, sulphides and chlorides in varying concentrations, with some small quantities of precious metals.	Flue dusts may or may not be discarded or intended to be discarded by the holder (and hence may or may not be considered as waste). If flue dusts contain valuable contents of (precious) metals, they will not be discarded but used as feed material in the pyro-metallurgical production of (precious) metals, and hence be non-wastes. If flue dusts are fully depleted of all valuable constituents[4], they may be discarded or intended to be discarded, and hence be wastes.	Flue dusts are the result of intentional pyro-metallurgical processes to produce (precious) metals via a number of oxidation steps. Flue dusts are produced during the refining and dedusting processes and may contain significant quantities of valuable metals in which case they are used as feed material and chemically transformed to recover valuable metals contained in them in further smelting processes. • Flue dust can be regarded as a by-product[5] or side-stream of (precious) metal refining processes. By-products that are not imported or placed on the market (and are only used on-site) are exempt from registration according to Annex V of the REACH regulation. • When flue dust is not kept on-site but transported to another site where it will be chemically transformed, it can be regarded as a transported isolated intermediate. If it is handled under strictly controlled conditions an Article 18 dossier is required; if it is not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of flue dust 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 flue dust both intra- and inter-registrants is very large as flue dust can result from various process steps having each its specific and potentially different feed material and reaction conditions. Flue dust is truly a substance of very variable and partially unknown composition.	Johnson Matthey Plc

[4] It is assumed that materials going to landfill / used as aggregate have always been depleted of metal content to levels below required levels and/or which are deemed to be leachable and/or bio-available.

[5] A by-product is a material that is not deliberately produced in a production process and that meets the following conditions:

- Further use of the substance or object is certain;
- The substance or object can be used directly without any further processing other than normal industrial practice;
- The substance or object is produced as an integral part of a production process; and
- Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental & health-protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

By-products are regarded by definition as non-waste.

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
8	**Residues, precious metal refining cementation**	Dry and wet residues recovered through cementation and/or reduction with a reducing agent (such as aluminium, copper, iron, zinc or organic agents) of precious metal refining streams. Residues include cements and polishing sludges which generally contain precious metals, metal oxides, and metal chlorides in varying concentrations.	Cements are not normally discarded or intended to be discarded by the holder, and hence are not normally wastes. If cements contain valuable contents of (precious) metals, they will not be discarded but used as feed material in the pyro-metallurgical production of (precious) metals. If cements are fully depleted of all valuable constituents[6], they may be discarded or intended to be discarded.	Cements are the result of intentional hydro-metallurgical processes to produce (precious) metals via a number of reduction steps. Cements are chemically transformed to recover valuable metals contained in them e.g. in further smelting processes. • Cements can be regarded as a by-product[7] or side-stream of (precious) metal refining processes. By-products that are not imported or placed on the market (and are only used on-site) are exempt from registration according to Annex V of the REACH regulation. • When cements are not kept on-site but transported to another site where they will be chemically transformed, they can be regarded as transported isolated intermediates. If they are handled under strictly controlled conditions an Article 18 dossier is required; if they are not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of cements 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 cements both intra- and inter-registrants is large as cements can result from various process steps having each its specific and potentially different feed material and reaction conditions. Cements are truly substances of very variable and partially unknown composition.	Heraeus Precious Metals GmbH & Co. KG

[6] It is assumed that materials going to landfill have always been depleted of metal content to levels of forms below required levels and/or which are deemed to be leachable and/or bio-available.

[7] A by-product is a material that is not deliberately produced in a production process and that meets the following conditions:

- Further use of the substance or object is certain;
- The substance or object can be used directly without any further processing other than normal industrial practice;
- The substance or object is produced as an integral part of a production process; and
- Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental & health-protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

By-products are regarded by definition as non-waste.

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
9.1	**Materials for reclaim - PM with or without supports**	Primary and secondary sources of precious metals in metallic, oxide, chloride and other forms in varying concentrations, resulting from the application of thermal or thermo-chemical processes or end-of-life criteria whose supports may, where present, include varying amounts of: □ Ceramics (such as silica, alumina and zeolites), □ Carbon or organics (such as carbon, paper, or plastics), and/or □ Metallics (such as stainless steel or other transition metal alloys).	Materials for reclaim are usually process residues or materials having reached the end of their use phase and which are not discarded or intended to be discarded by the holder because they contain significant quantities of valuable precious metals which can hence be used as feed material for the production of precious metals. Although the holder never discards or intends to discard these materials, they may be seen as waste by some authorities and as non-waste by others.	• Some materials for reclaim are not intentionally manufactured but do frequently enter the precious metal refining process as feed material to be chemically transformed in smelting or another pyro- or hydro-metallurgical process step(s), because of their valuable content of precious metals. • Some Materials for reclaim (e.g. 9.3) can be regarded as by-products or side-streams of (precious) metal refining processes. By-products that are not imported or placed on the market (and are only used on-site) are exempt from registration according to Annex V of the REACH regulation. • When materials for reclaim are not kept on-site but transported to another site where they will be chemically transformed, they can be regarded as transported isolated intermediates. If they are handled under strictly controlled conditions an Article 18 dossier is required; if they are not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of materials for reclaim will depend on the process they result from, their nature, and/or their 'use' stage; the selection of the analytical technique will depend on the form and type of material as well as 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 materials for reclaim both intra- and inter-registrants is large as materials for reclaim can result from various primary and secondary sources and various process steps having each its specific and potentially different feed material and reaction conditions. Materials for reclaim are truly substances of very variable and partially unknown composition.	Johnson Matthey Plc
9.2	**Materials for reclaim - PM in bricks, crucibles, trays, etc.**	Spent artifacts used in the processing of precious metal streams that have retained fractions of precious metals from/during processing and that are reclaimed as secondary sources of precious metals. These materials may be silicate or refractory based, and contain low and varying concentrations of precious metals in metallic, oxide, and other forms.				Johnson Matthey Plc
9.3	**Materials for reclaim - PM production by-products**	Materials that are non-intentional products of the production and refining of precious metals, which contain precious metals as well as other metals and their compounds (oxides and others) in varying concentrations. One example of such refining by-products are so-called production "sweeps" and dusts.				Johnson Matthey Plc

Nr	Name	Description	(Non-)waste status	Intermediate status	UVCB status	Lead Registrant
10	**Lead bullion Precious Metal Rich**	Primary and secondary feed materials usually in the form of residues containing low concentrations of precious metals, together with higher and variable concentrations of base metals and refractory materials that are mixed with fluxes and smelted with a lead collector, resulting in two phases: a lead one which concentrates precious metals, and a silicate slag phase (Slags, precious metals refining). The lead phase, or Platinum Group Metal Rich Lead Bullion is used as a feed in the hydrometallurgical upgrading of platinum group metals; it contains predominantly lead with lower concentrations of platinum group metals, silver and gold and other non-ferrous metals in varying concentrations.	Lead bullion, which is always precious metal rich, is not discarded or intended to be discarded as it is a feedstock to the Pb and PM refining processes. It is hence not a waste.	Lead bullion, PM rich is intentionally manufactured as a collector of precious metals in PM containing lead refining. Lead bullion, PM rich is mixed with fluxes and smelted with a lead collector, resulting in two phases: a lead one which concentrates precious metals, and a silicate slag phase. It is subsequently chemically transformed to extract the precious metal content from the lead bullion in order to manufacture the pure precious metal. It is hence truly an in-process intermediate in the production of pure precious metals. If it is handled under strictly controlled conditions an Article 17 or 18 dossier is required; if it is not handled under strictly controlled conditions an Article 10 (intermediate) dossier will be required instead.	The composition of lead bullion, PM rich is metallic, and can hence easily be fully determined by the applicable analytical technique. The variability of the composition of lead bullion, PM rich both intra- and inter-registrants is large as the bullion manufactured via a specific smelting process will be influenced by the variability of the metallic composition (precious metals and impurities) of the feed material smelted to produce the bullion and the constituents dragged during the chemical transformation of the bullion after use as a collector of precious metals. Lead bullion, PM rich is truly a substance of variable composition.	Vale Europe Ltd

Additional questions for input by registrants / to be addressed at the next PM Refinables meeting:

1) The same material may be designated as waste and as non-waste by different costumers/suppliers. How to reconcile this different approach to the regulators? In addition, the (non-)waste status is not always clear for materials received from costumers.
2) When registered under REACH, slags can be intentionally used as aggregate but can also be used as intermediate. Are there other PM Refinables having this dual profile of intentional use as intermediate and substance?
3) Slags from PM refining usually contain valuable metals that are further recovered. If a process for precious metals refining is designed to produce a slag with lowest level of metals (valuable as well as hazardous) than this slag can be used as aggregate for road construction but cannot be used as intermediate at the same time – no possibility to recover metals. Or in other words how can we justify that slag with lowest metals content and slag with high metals content are the same substance = different process and different composition? Or if a slag meets the criteria for road aggregate, this will be valid for a special profile of PM slag that will require a special assessment (effects, exposure scenarios) and cannot be associated to other slags in the dossier?
4) If slags are registered as a full substance (Article 10 dossier), it is important to specify the tonnage used as intermediate and the one used as substance. This will help later if one of these are indeed classified and meeting the SVHC criteria, to be exempt from Authorisation.
   It is assumed PM slag used in construction would be depleted of hazardous constituents and show no release which would mean it should not be classified, but do we have composition or T/D, bio-elution test results to demonstrate this? If not, we may need to run some bio-elution tests on PM slags to refine the HH classification of the (intermediate) slags (if we go for Article 10 dossier). It would however be very difficult to make sure the results of these bio-elution tests are valid for all slags of all companies (very variable material across registrants).
5) Which slags, slimes & sludges, flue dusts, cements and materials for reclaim can be considered a by-product? Decision should be made by each registrant on a case-by-case basis and taking into account not only the criteria set in the Waste Framework Directive but also by-product criteria which may be set by Member States at national level (see Waste factsheet).