



Precious Metals & Rhenium Consortium
Brussels, 3 February 2015, 13:00-16:30



PM Refinables Sameness Expert Group Meeting



1. Welcome & Introduction

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Katrien ARIJS



1.1. Reminder on Confidentiality and Competition Law

1.2. Tour de table and apologies

1.3. Approval of the Agenda



Agenda

1. Welcome and introduction
2. Information from ECHA on SID/sameness of inorganic UVCBs
3. Refinables SID decision tree: discussion of process description of all Refinables and need for splitting
4. Next steps/actions to draft Refinables SID document
5. AOB, next meetings/calls and closing remarks





2. Information from ECHA on SID/ sameness of inorganic UVCBs

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2.1. ECHA Substance Identification and Sameness Workshop 6-7 Oct (1)

- Focus on SID and substance sameness ('who can register together?') of UVCBs
- ± 60 participants: 1/3 MSCA, 1/3 stakeholders and 1/3 ECHA staff
- Presentations from ECHA, MSCA and industry (chemical, petroleum, metal) + discussion in breakout groups (different industry groups) on how to assess sameness of UVCBs
- EM was asked to present their view on substance sameness at the workshop:
 - Presentation prepared by Katia Lacasse, Violaine and Katrien (sent to Ref WG on 15 Sep)
 - (Fictitious) metals UVCB case presented at break-out session (Cu matte)

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ECHA SID & Sameness Workshop 6-7 Oct (2)



UVCB substances – EINECS inconsistencies

- EINECS was not required to consist of a list of single substances
- The limits of EINECS for the identification of substances covered by the inventory has been recognised

Guidance on substance identification

“It is important to note that for some EINECS entries, the description of a substance is relatively broad and could potentially be considered to cover more than one substance”

CARACAL paper on Q&A regarding the role of EINECS (2010)

“One EINECS entry may also correspond to several substances or several EINECS entries may correspond to one and the same substance”

“In case of doubt, it is recommended to share data as widely as possible [...] and, at the same time, to interpret the substance definition narrowly”

- Recital 45 indicates that multiples substances may be covered by the same EINECS entry
- Uncertainties on substance sameness still to be resolved regardless of whether a substance is covered by EINECS or not!

• 7



ECHA SID & Sameness Workshop 6-7 Oct (3)



Proposed substance sameness criteria

- 1) Identify the parameter(s), if any, allowing a structural representation of the substance
- 2) Identify any additional necessary parameter(s) necessary to represent the substance by the reaction scheme
- 3) Identify any additional necessary parameters necessary to represent the substance by the process

The combination of these parameters set the criteria for substance sameness

• 8



ECHA SID & Sameness Workshop 6-7 Oct (4)



Structural representation

- Starting point: structural representation of well-defined substances
 - Achieved by the “80% rules”
 - 80% rule (mono-): No need to go beyond representing 80% of the composition of a substance
 - 80-10% rule (multi-): When it is not possible to define 80% of the composition by a unique structural depiction, a structural (qualitative) representation of the composition based on the identity of the main constituents is considered
- The structural depiction of well-defined substances is normally sufficient to determine if substances can be registered together
 - Same structural depiction → substances can be registered together
 - Different structural depiction → substances cannot be registered together

• 9



ECHA SID & Sameness Workshop 6-7 Oct (5)



UVCB substance depicted as the output of a process

- According to the EINECS reporting rules, the depiction essentially consists of
 - Identity of the precursors
 - Technology
 - ‘typical’ composition
- Outputs from processes relying on different sources or process technologies would in principle not refer to the same substance
- ‘Typical’ composition is taken care of at the level of the structural depiction according to the proposed methodology

• 10



ECHA SID & Sameness Workshop 6-7 Oct (6)



Note on the depiction of the technology

- The depiction must be proportionate
 - Different process parameters (e.g. reaction temperature 100°C vs. 120°C, pressure) do not necessarily mean that the technology depiction will be different
 - If the inherent variability does not allow the definition of a technology parameter, such parameter should not be used as a substance sameness criteria
 - Example: identity of secondary sources
- Focus on the parameters that matter!
- Definitions of EINECS-listed UVCB substances as a reference for the technology depiction

• 11



ECHA SID & Sameness Workshop 6-7 Oct (7)

Key messages:

- Both the different industry sectors and the MSCA are still struggling with SID of UVCBs.
- There was general support to explore the applicability of the proposed 3-step sameness methodology (structural representation/reaction scheme/process output) further, but there were still quite some questions on how it will work in practice. ECHA doesn't have answers to all these questions and recognises there will always be a 'grey zone' for SID of UVCBs.
- In the 'grey zone', after using the proposed methodology, it is important to make the argumentation that the chosen SID approach is sound.
- The use of hazard information in deciding on SID of UVCBs requires further discussion. There was general agreement that different classifications can be covered in a joint registration.
- Some informal feedback from our break-out session: ECHA does not expect us to revise our SID approach completely but thinks **some further work is needed from industry's side to rationalise and document our approach so that it is transparent.**

• 12



ECHA SID & Sameness Workshop 6-7 Oct (8)

- Background doc and workshop report (Katrien/Katia) available in Annex 3.1 & 3.2.
- ECHA published the workshop presentations and proceedings on its website: http://echa.europa.eu/news-and-events/events/event-details/-/journal_content/56_INSTANCE_DR2i/title/workshop-on-substance-identification-and-substance-sameness
- ECHA gave a summary paper of the workshop at Caracal:
 - Developed methodology sets priority to structural representation followed by reaction scheme & process output. This hierarchy requires considerations on the description of the composition to be made first before any other additional depiction is applied to define the substance sameness criteria.
 - The methodology recognises the limits of identifying UVCBs by their chemical composition. Accordingly, it does not require setting substance sameness criteria based on the structural representation only. It entails instead the identification of systematic structural characteristics which, if the substances were to be well-defined, would constitute substance sameness criteria. The structural depiction therefore relies on the "80% rules" established for well-defined substances.
 - Proposal on substance sameness should not go beyond what is necessary to meet the objectives of the registration process. The proposed methodology allows registrants to deviate from the rules for setting the substance sameness criteria, as it can be done for well-defined substances. The deviation must however be clearly and transparently justified.
 - Proposed methodology should overall be seen as a prolongation of existing SID principles and therefore not in contradiction with the Guidance on SID.

• 13



ECHA Roadmap for 2018 REACH registration deadline: SID actions

- Well-documented, unambiguous SID is essential for a solid registration, and all other information in the registration will be mirrored against it.
- ECHA SID guidance is lacking information for certain complex substance types, such as UVCBs
 - > ECHA will continue collaboration with sector-specific groups to develop sector-specific SID guidance to assist registrants (where relevant, within the framework of the OECD).
- The ECHA SID Guidance has a section on **substance sameness** but text currently limited in its scope and depth, in particular for UVCBs
 - > ECHA is developing possible solutions for a further structured approach on substance sameness that were discussed amongst key stakeholders in a workshop in Oct 2014. The international chemicals management arena may also need to be considered in the discussions to try to move some way to an internationally harmonised system.

Milestones:

- Methodology established for substance sameness (2015).
- Potential review of the Guidance on Substance Identification and Naming or other types of material for addressing substance sameness (2015).

• 14



European Commission REACH SIDC project

- <http://sidc.reach-2018.eu/>
- SID project tendered out by the European Commission, in which SID and sameness of complex substances is investigated, i.e. substances for which the application of the SID provisions of REACH and the rules and conventions of the SID guidance pose challenges.
- Aim: develop sector-specific factsheets providing key information and best practices in identification of complex substances in selected industry sectors.
- EM has reached out to the European Commission on this project in case they want to draft NFM sector specific sheets for inorganic UVCBs.
- SID Workshop 27-28 April 2015 in Brussels.

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• 15



Structural representation Refinables (1)

- Sameness: demonstrate that 80% of the composition of the various streams 'grouped' under a given UVCB registration, is driven by the same constituents; even if these are present in varying concentrations in each stream
- How to select 'main' constituents? Cut-off concentration? Which concentrations to use (min, max, typical)? Classification drivers?
- Example: PM slags 3.2 (Slags, production of precious metals containing materials other than doré)
 - Composition 3 streams compared
 - Stream 1 and 2: all constituents for which typical conc. $\geq 0,5\%$ in both streams
 - Compared to stream 3

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• 16



Structural representation Refinables (2)

Name	Formula	STREAM 1			STREAM 2			STREAM 3		
		Composition (elemental conc.)			Composition (elemental conc.)			Composition (elemental conc.)		
		min	max	typical	min	max	typical	min	max	typical
Aluminium	Al	2	20	7	5	20	11,5	1,5	6	2,96
Barium	Ba	0,1	8	1	0,5	6	0,5	0,001	0,5	0,18
Calcium	Ca	15	25	20	5	12	10	0,001	5	1,5
Iron	Fe	1	15	3	7	24	10	3	10	5,91
Magnesium	Mg	0,2	4	0,5	1	7	6,5	0,5	3	1,65
Silicon	Si	10	30	20	14,5	24,5	19,5	10	20	15
Sum		28,3	102	51,5	33	93,5	58	15	44,5	27,2

- For many Refinables, 80 % rule will not demonstrate sameness (e.g. Slags, Slimes & Sludges). For e.g. Doré, it may be feasible.
- If we rely mainly on process and input materials as criteria for substance sameness, we should be very transparent!

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• 17



2.2. Examples how ECHA has challenged SID of inorganic UVCBs (1)

Ferromolybdenum slags

- Compliance check LR: ECHA wanted a much more comprehensive technological process description, that included more detail of process inputs and process parameters, and an explanation why variable inputs would not lead to different grades of the UVCB substance.
- Compliance check co-registrant: ECHA wanted more information about the known constituents of the UVCB, a more comprehensive technological process description, that included more detail of process inputs and process parameters, more detail of analytical methodologies, and an explanation why variable inputs would not lead to different grades of the UVCB substance.
- Responses submitted Dec 2014. Key challenge: align responses so that small differences in inputs and process would not encourage ECHA to decide that different grades of the substance are produced.

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• 18



Examples how ECHA has challenged SID of inorganic UVCBs (2)

Board of Appeal case A-008-2012

- Substance: SDA Product (desulphurization of exhaust gases by semi-dry absorption method from the coal fired power plants).
- Manufacturing process: desulphurization carried out with preliminary dust (ash) extraction step but also with partial or no dust extraction -> 'pure SDA' or 'mixture SDA Product and ash'.
- ECHA concluded the registration dossier contained information on more than one substance -> separate registrations needed.
- The application or non-application of a dust extraction step in the process resulted in **systematic differences in compositions** -> composition was considered the root cause for differentiating between substances (regardless of whether they have the same hazard properties).
- 'Mixture SDA Product and ash': output is the result of the same process and would therefore be considered a single substance for registration purposes + 2 substances cannot be physically separated.

• 19



3. Refinables SID decision tree: discussion of process description of all Refinables and need for splitting

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• 20



UVCB identification rules: decision tree for SID

- Original SID of Refinables started from EINECS entries
- Decision tree: start from refining processes, assign Refinables and check if no over-grouping was done
- Updated version decision tree circulated following last PM Ref WG meeting
- Consists of 4 parts with references to the various parts as applicable
- Processes are split in hydro-, electro- and pyro-metallurgical processes (part 1-3).
- Part 4: SID checked for all Refinables based on the source -> SID validation step rather than an SID determination step (justification why we are grouping several sources for the same Refinable)
- Complemented with list of processes + definitions prepared by C. Roehlich

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• 21



3.1. Hydro-metallurgical processes

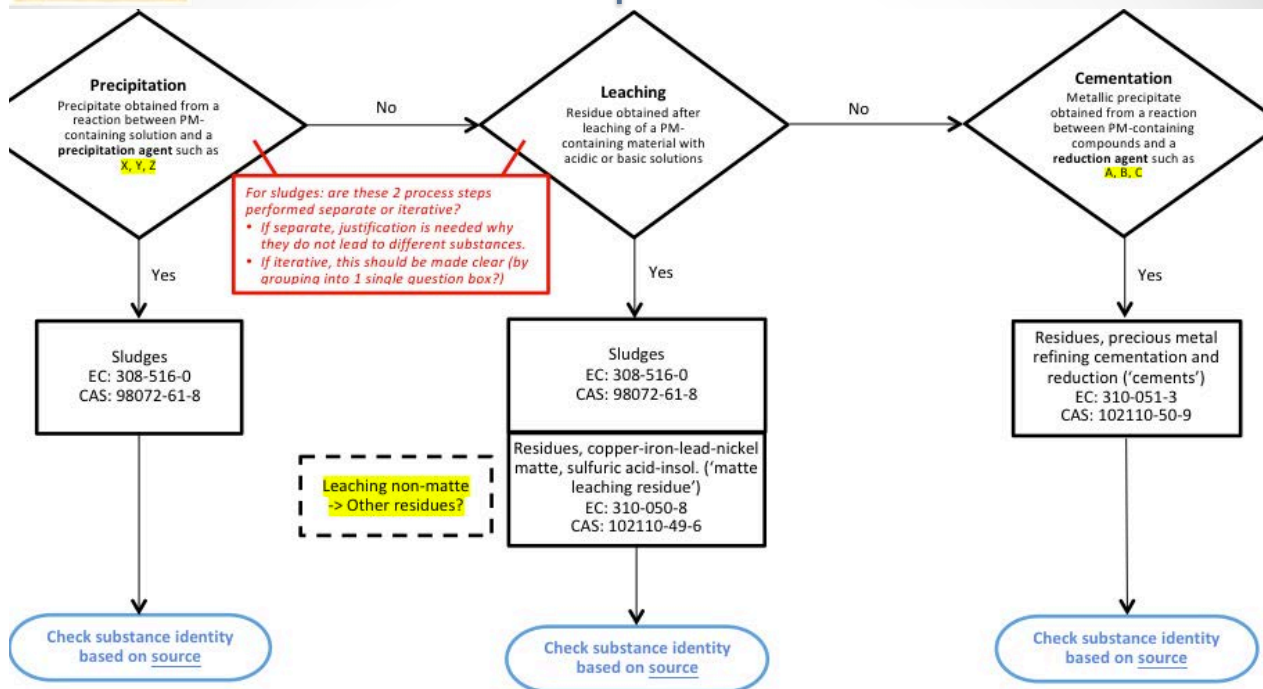
Metallurgical processes that occur in an aqueous, water-containing or water-like medium, mainly mediated by substances' reactivity in this medium, i.e. their solubility, speciation, ligand coordination, acid/base and redox behaviour.

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• 22



Decision tree: Hydro-metallurgical processes



Can precipitation, leaching or cementation of PM-containing materials lead to other substances than the ones mentioned here? If so, what is its name and where does it go? Waste for discarding? Concentrated PMs for further refining?

• 23



BREF Hydro-metallurgical processes (1)

- Leaching and Dissolution
 - Leaching: intended dissolution and removal of at least one part or component from a material, leaving at least one other part of the material undissolved (incl. "washing" with neutral, acidic or basic solutions). Leaching can also be performed in conjunction with a chemical transformation or modification of at least one part of the material (e.g. to suppress its dissolution).
 - Dissolution: process intended to dissolve the whole material. However, there is not always a guarantee that a dissolution process will be able to actually dissolve the whole material, or during the process new insoluble components are formed, which then precipitate.
- > Solid residues: Residues from Leaching and Dissolution (Sludges; Matte leaching residue)
- Precipitation and Crystallization: formation of an insoluble compound from a dissolved species by addition of a precipitation agent or changing the medium's characteristics (concentration, temperature, pH, polarity).
 - > Solid precipitate: Precipitates from PM Refining (Sludges)

• 24



BREF Hydro-metallurgical processes (2)

- Cementation and Reduction: creation of a metal in its elemental/metallic state from a dissolved species by the addition of a reduction agent (e.g. a more electropositive metal = cementation; reduction agents like hydrazine, formaldehyde etc. = reduction)
-> Metallic precipitate: *Residues, PM refining cementation and reduction*
- Adsorption: PMs can be removed from solutions by contacting the solution with a solid phase. The PM is depleted from the solution and collected on the solid phase by:
 - physisorption (= physical adsorption),
 - electrostatic attraction (= ion exchange) or
 - the formation of a chemical bond (= chemisorption; scavenging).When the solid phase has reached its end of life, it is sent to Refining to reclaim the PM content. Since this is an end-of-life product, and not so different from e.g. a spent catalyst, it is grouped with *Materials for Reclaim, PM with or without support* (see below).

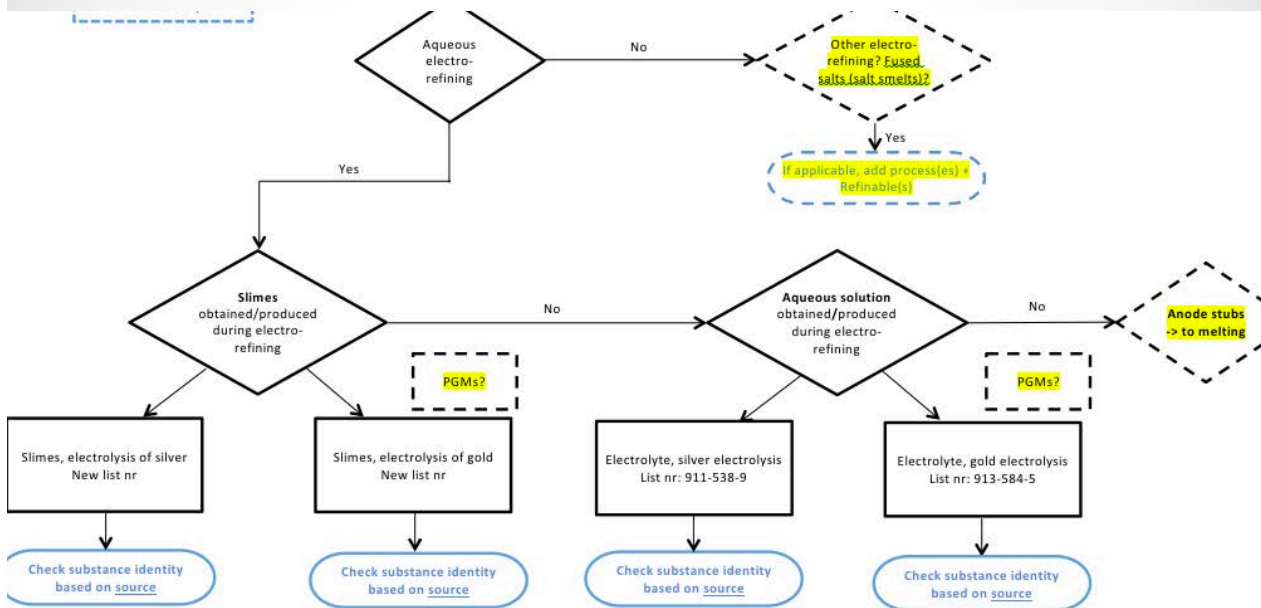


3.2. Electro-metallurgical processes

Metallurgical processes that are mediated by a flow of electric current from an external source through a medium, to enforce a chemical redox reaction. In most cases, the reaction is a dissolution or deposition of one or more metals.



Decision tree: Electro-metallurgical processes



BREF Electro-metallurgical processes

- Electrowinning: removal of dissolved or colloidal (P)Ms from solution by an electric current, mostly as metallic layer on a substrate (like the electrode itself) or a metallic precipitate.
-> In principle, this is the same reaction as forming a metallic precipitate by adding a reduction agent or a more electropositive metal to the solution, thus forming an identical or comparable metallic solid. If this solid cannot be deemed a pure substance and registered as such: reasonable to group with Residues, PM refining cementation and reduction, in spite of the different processes they originate from?
- Electrorefining ("electrolysis"): simultaneous electrochemical dissolution of crude metal at one electrode and electrochemical deposition of higher purity metal on the other electrode, while the impurities are collected as a solid forming and precipitating in the medium ("anode slime"), or remain in the electrolyte.
-> Slimes from electrorefining (Slimes, electrolysis of Ag; Slimes, electrolysis of Au) and Spent electrolyte (Ag electrolyte; Au electrolyte)



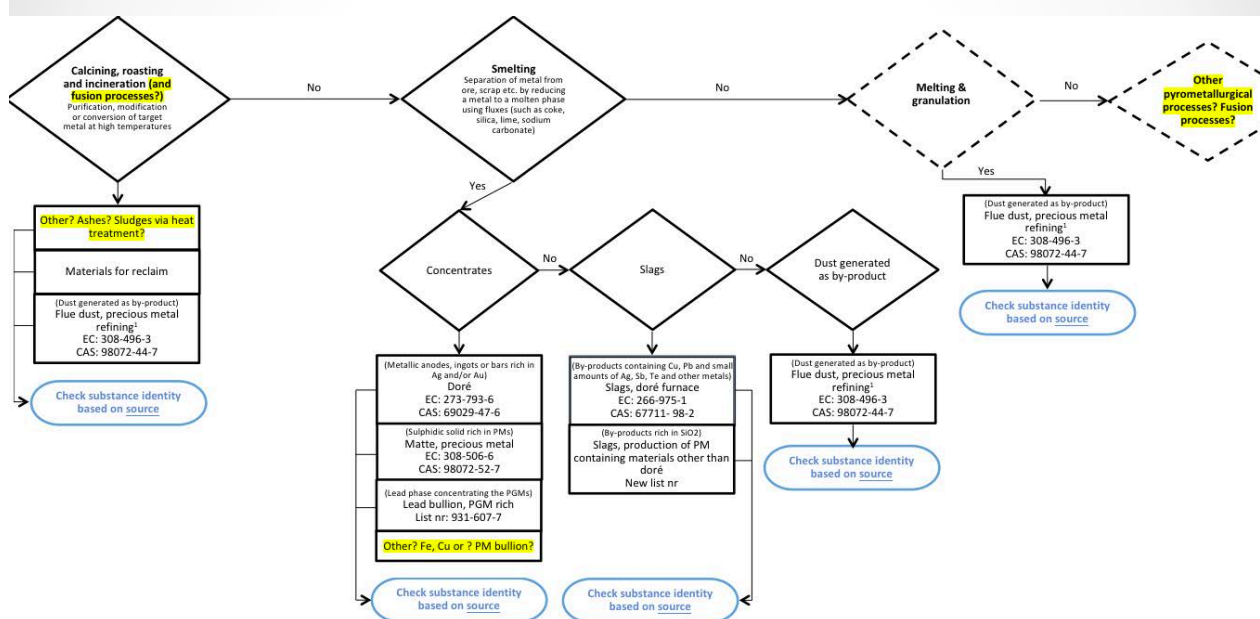
3.3. Pyro-metallurgical processes

Metallurgical processes mediated and dominated by high temperatures. The high temperature is used to

- o (create and) remove volatile components
- o adjust the chemical or physical form of a material
- o enforce a (otherwise usually slow or incomplete) chemical reaction, e.g. between a solid and a gas, or
- o melt materials that are otherwise solid at ambient temperature, and make use of their properties and reactivity in their molten state.



Decision tree: Pyro-metallurgical processes



¹ Although they result from various processes that use various sources, flue dusts from PM refining cannot be separated per process because they are physically collected via the same centralised exhaust ventilation system in each site.



BREF Pyro-metallurgical processes (1)

- Sintering: heating a solid substance to a t° , at which it is not or only partially melted, and particles start to adhere and build agglomerates and larger, more robust structures
-> not accompanied by a chemical reaction, output material = input material -> not a different Refinable
- Thermal treatment: heating to enforce a certain reaction of the material that only occurs at higher t° . These reactions usually include decomposition of the material itself, yielding more volatile compounds (calcination, pyrolysis); or the reaction with a (reducing or oxidizing) gas (incineration, roasting, chlorination, reduction); and removal of volatile compounds (drying, fuming).
-> in reality, the material actually undergoes several of these processes during a thermal treatment simultaneously.
-> group processes that include the heating of a material in a gas atmosphere (inert, oxidizing or reducing) without a solvent, and/or only under partial melting of the material
-> resulting residues: Ashes

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• 31



BREF Pyro-metallurgical processes (2)

- Fusion: uses the reactivity of a material (the "flux"), that is otherwise solid at ambient conditions, in its molten state at higher t° . The molten flux reacts with the PM-contg. material that is to be processed by physical (dissolution) and chemical (oxidation, reduction, acid-base reactions) phenomena. At the end of the process, the mixture is cooled, and a solid fusion cake is obtained.
-> difference Fusion - Smelting: In a Fusion process only 1 liquid phase is present
-> Fusion cake: mixture flux and leaching residue or mixture flux and ash?
- Smelting: process to separate PM from usually insoluble materials. To accomplish that, the material is mixed with additives/fluxes, and heated up to melting. In contrast to a Melting process, chemical reactions now take place, which usually cover the reduction of PMs and other metals in the material by a reduction agent, oxidation of less noble metals by an oxidant, alloy formation between metals, mixed sulfide formation, as well as mixed oxide formation. In contrast to a Fusion process, a smelting process results in 2 liquid phases which are immiscible and thus separated from each other: A slag (containing mixed oxides, fluxes,...) and a concentrate (PM collector alloys, PM-containing sulfides = PM smelting matte).
-> Slags, doré furnace; Slags, production of PM contg. materials other than doré
-> Doré; Matte; Pb bullion PGM rich

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• 32



BREF Pyro-metallurgical processes (3)

- Melting: Heating a solid substance to or above a t° at which it becomes a liquid. Usually this is performed to change the phys. form of a material, like granulation or ingot casting.
 - > not accompanied by a chemical reaction (in contrast to smelting and fusion processes), output material = input material -> not a different Refinable
 - > however, during melting some impurities will usually segregate from the material, which are usually collected by a small amount of fluxing agent forming a slag, and removed prior to or after cooling the molten material.
 - > group slags from Smelting & Melting?

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• 33



BREF unspecific processes that lead to production of PM contg. material

Materials for Reclaim: originate from the production, processing, or use of PM-containing materials and products.

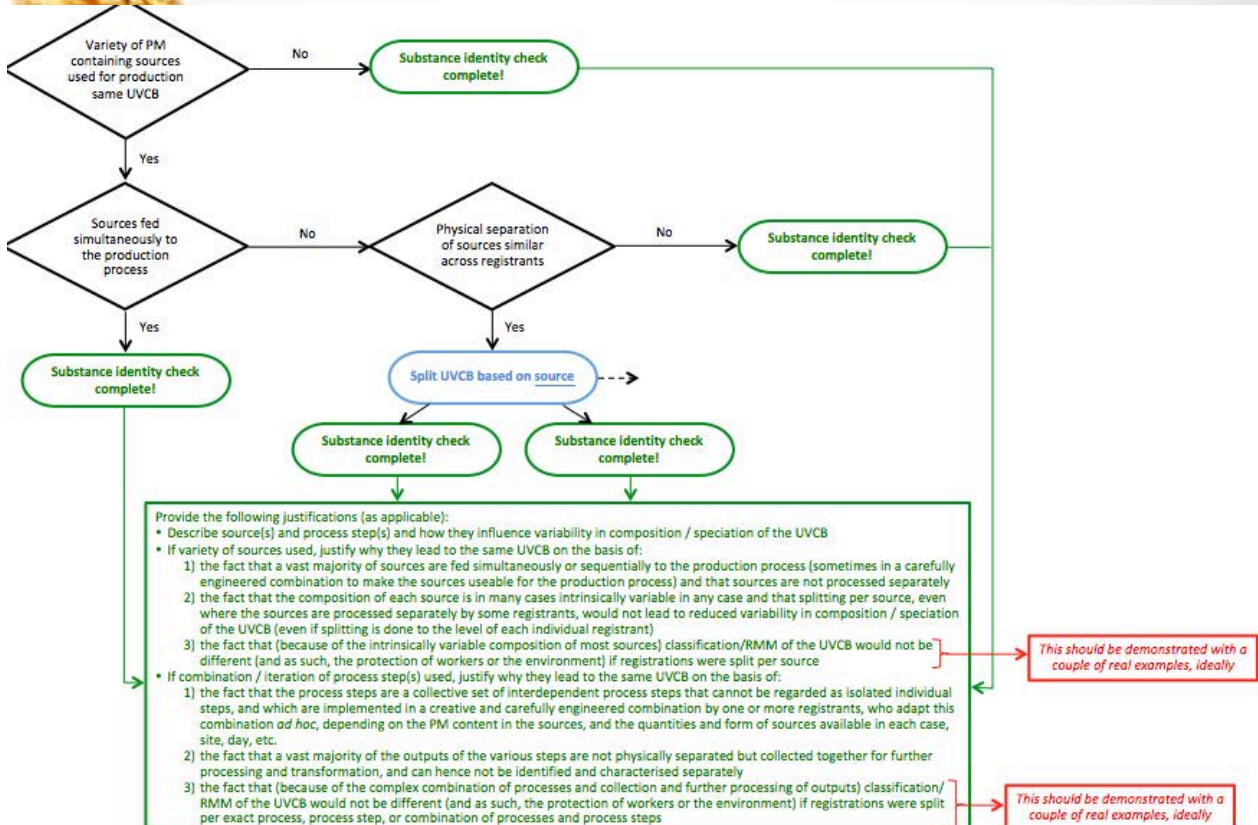
- Dust collection: In many processes during production or processing, also refining, of PM-contg. materials, dusts are generated and collected in appropriate facilities. These processes can include milling, thermal treatment, melting, smelting, grinding or polishing. Commonly, dusts from several processes are collected through a single exhaust gas filtering system at a site. This mixture of filter dusts is then sent to Refining to reclaim the PM -> *Flue Dusts, PM Refining*.
- Mechanical cleaning: It is common practice in PM processing industry to clean floors and equipment regularly, to collect any residues of PM-contg. material on them and reclaim the PM value. The resulting sweeps and cleaning tools (like swipes) are usually collected from several facilities and processes and combined before sent to refining as *PM scraps and sweeps*.
- Equipment to process PM-contg. materials: Parts of an equipment in which PM is processed can become contaminated permanently with PM, which has to be reclaimed when it has reached its end of life. These are sent to Refining as *PMs in bricks, trays, crucibles etc.*
- Use of PM products: variety of products based on PM for several applications; these include catalysts, jewelry, dental alloys, sensors, wires, sputter targets, solders, pastes, plating solutions, and many more. Due to their PM content, any end of life product as well as out-of-spec products or production wastes are sent to PM refining as *PMs with and without support* to reclaim the high value.

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• 34



3.4. Decision tree: Sources



4. Next steps/actions to draft Refinables SID document

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Way forward

- Finalisation SID decision tree for approval at PM Ref WG meeting 25 March
- Draft document explaining our approach to SID using:
 - SID decision tree
 - Process definitions
 - Overview of process and source information available to date



• 37



5. AOB, next Meetings/Calls & Closing Remarks

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• 38



Thank you!

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