



## Substance identification decision tree Background document

*Note: the objective of this document is to provide background information to the substance identification (SID) decision tree for UVCB substances.*

### Index

|                                                                                            |   |
|--------------------------------------------------------------------------------------------|---|
| 1. Identification of UVCB substances.....                                                  | 1 |
| 2. Justification for variable composition of inorganic UVCB substances .....               | 2 |
| 3. Justification for variable speciation of inorganic UVCB substances.....                 | 2 |
| 4. Influence of the source and feed material in the variability of an inorganic UVCB ..... | 2 |
| 5. Influence of the process step(s) in the variability of an inorganic UVCB.....           | 3 |

### 1. Identification of UVCB substances

Recital (45) of the REACH Regulation mentions: ‘The European Inventory of Existing Commercial Chemical Substances (EINECS) included certain complex substances in a single entry. UVCB substances (substances of unknown or variable composition, complex reaction products or biological materials) may be registered as a single substance under this Regulation, despite their variable composition, provided that the **hazardous properties** do not differ significantly and warrant the **same classification**.’

UVCB substances, cannot be sufficiently identified by their chemical composition, because:

- 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.

As a consequence, UVCB substances require other types of information for their identification, in addition to what is known about their chemical composition. The main identifiers of a UVCB are name, origin or source and process used.

- The name of a UVCB substance is a combination of source and process with the general format: first the source and then the process(es).
  - UVCB for which entries in the EC and/or CAS inventories existed before the REACH regulation would not necessarily strictly follow this format. However, UVCB for which new entries are proposed should be given a name which follows the format recommended in the ECHA Guidance.
  - In any case, whether the format of the (existing) name follows ECHA Guidance recommendations or not, any UVCB entry should carry a description that completes the substance identification.
- Ensure the following information is included in the description of the manufacturing process:
  - starting materials and/or source. Mineral sources have to be described in generic terms (e.g. primary material, secondary feeds, etc.). ;
  - process parameters (e.g. use of catalyst, temperature);
  - reaction type and scheme (identification of each individual process step). Processes are identified by the type of chemical reaction or as a type of refinement step (e.g. smelting, refining, precipitation, etc.);
  - purification and isolation steps.

This information must be included in the description field in section 1.1 of the IUCLID dossier. When describing the source materials, manufacturing processes, etc. of an inorganic UVCB the terminology used in the non-ferrous metals BAT Reference document (NFM BREF) issued by the EU Joint Research Centre IPPC Bureau (<http://eippcb.jrc.es/reference/nfm.html>) should ideally be used.

- Ensure other identifiers are sufficiently well described: known or generic composition, concentration of metals. For a UVCB substance:
  - the chemical composition and the identity of the constituents should still be given **as far as known**;
  - all known constituents and all constituents present at concentrations  $\geq 10\%$  should be specified by at least an English-language IUPAC name and preferably a CAS number;
  - constituents that are relevant for the classification and/or PBT assessment of the substance shall always be identified by the same identifiers, independently from their concentration;
  - unknown constituents should be identified as far as possible by a generic description of their chemical nature;
  - the typical concentrations AND concentrations ranges of the known constituents should be given.
- For each process (step), the composition of the starting material and output material should be specified.



The relevance and importance of one or the other cause of variability (source and process) will largely depend on the type of inorganic UVCB substance. The feed materials and the major production processes and technologies should ideally be mapped for each inorganic UVCB substance separately, in order to better visualise (dis)similarities across related substances. Again, the NFM BREF can be used as a basis to map relevant production processes and input/output substances used/obtained in each case or step.

## 2. Justification for variable composition of inorganic UVCB substances

The inorganic NFM UVCB substances typically have a variable composition. Such variability is mainly related to:

- the origin of the material (i.e. the source, for e.g. varying ore characteristics over time and geographical origin or composition of materials reclaimed from the so-called 'urban mine' and industrial processes for recovery of the valuable constituents); and
- the type, combination, and iteration of process steps used (e.g. hot process, cold process, smelting, electrolysis, solvent extraction, precipitation, melting, etc.) which may be regarded as individual and isolated process steps in some cases, or as a collective set of interdependent process steps in other cases.

The variability of the composition of inorganic UVCB substances is highly dependent on the composition of the source material or precursors as well as on the number of individual processes or process steps resulting in the same substance. Inorganic UVCB substances are hence identified on the basis of their origin and process as any other UVCB, but the identification is done in a more contextual/realistic manner rather than in a sequential manner: origin first and process second. The origin and process(es) are considered in an integrated and iterative manner when identifying these, considering the specific reality of the site that operates the related source materials and process(es).

## 3. Justification for variable speciation of inorganic UVCB substances

Depending on the source(s) of the feed material(s) and the process steps used to produce each inorganic UVCB substance, each constituent (i.e. each metal or metal compound) will be present in various chemical and/or mineralogical forms or species. Indeed, potential differences in conditions can predict and justify differences in resulting speciation of the substance. Possible species are:

- metallic species in the zero oxidation state: e.g. Cu, Au, Pb or Ni;
- soluble and sparingly soluble metal compounds: e.g.  $\text{CuSO}_4$ ,  $\text{CuS}$ ,  $\text{AgCl}$  or  $\text{PbSO}_4$ ;
- minerals: e.g. Chalcopyrite;
- alloys.

In addition, each of the above form or species may be present as inclusions in other species (e.g. metallic inclusion in mineral) and various crystalline structures or matrices. Differences in the forms or species do not necessarily trigger different substances but will usually guide the sameness assessment and the need to merge or split SIEFs for substances with comparable or dissimilar compositions. It is expected that crystalline and mineralogical species can have an influence on the hazard profile of a substance. Although the nature of the process is expected to infer on/predict the species that results from the process, this is not always the case because of the influence of the input material used (which may vary on a daily basis in some cases), the distinct reactivity of different constituents in each process step, and also because of post-processing reactions which may occur quickly after the output is produced, upon exposure to different oxidative conditions.

## 4. Influence of the source and feed material in the variability of an inorganic UVCB

In pyrometallurgy, one or more smelting steps apply heat on a specific type of feed material, which will decompose, aiming at separating some constituents in the gas or slag phase from the metal(s) of interest. Each smelting step achieves a higher concentration (or purification) of the metal(s) of interest in the material processed. For example, during smelting of a naturally occurring complex metal, four potential UVCB substances are formed:

- 1) Metal matte X
- 2) Slag from metal refining X
- 3) Metal blister/anode X



#### 4) Flue dust from metal refining X

If secondary feed material is added to the above smelting process, the composition of the source material entering the process is expanded. The composition of the UVCB substances resulting from this primary + secondary feed material smelting process are hence likely to differ from the composition of those UVCB substances resulting from primary only feed material smelting:

- 1) Metal matte X<sup>1</sup>
- 2) Slag from metal refining X<sup>1</sup>
- 3) Metal blister/anode X<sup>1</sup>
- 4) Flue dust from metal refining X<sup>1</sup>

However, for REACH registration purposes, because their origin and process remain the same or very similar, X, X<sup>1</sup>, ..., and X<sup>n</sup> 'versions' of each inorganic UVCB is considered to be the same and subject to registration via a common dossier.

The more uniform the composition of the feed material used in the refining process is (over time, geographical location, across registering legal entities, etc.), the less variable the composition of the resulting inorganic UVCB substances will be. The more variable the composition of the feed material is, the more variable the composition of the resulting UVCB substances will be. This latter case commonly happens in the precious metals sector, where due to the value of the precious metals contained in the various types of feed material, almost any feed material enters the production process, ranging from concentrated ores and industrial process outputs, to secondary materials for reclaim and waste. UVCB substances resulting from smelting processes in the precious metals industry will therefore result in much more variable Precious metals matte, slags from precious metals refining, doré, flue dust from precious metals refining, etc.

#### 5. Influence of the process step(s) in the variability of an inorganic UVCB

The same UVCB substance can originate in various processes or process steps. For example, flue dust is generated from all pyro-metallurgical processes producing dust and fumes (smelting, melting, incineration, calcination). Even if they result from different processes or process steps, they are one same type of flue dust for registration purposes. This is further demonstrated by the fact that in some sites flue dusts collected from several pyro-metallurgical processes are collected, captured and treated via the same exhaust ventilation or duct, dedusting and scrubber system; it is hence difficult to re-allocate each flue dust to one or the other step of the metal refining process and it must be considered as one and the same substance.

The same applies to a number of other UVCB substances regularly produced and recovered in metal refining processes such as slimes and sludges which result from a number of electrolytic and hydro-metallurgical processes, cements which result from precipitating a variety of process residues, etc.

When an inorganic UVCB substance is processed, for a number of these this is done in a stepwise approach where key impurities are removed and valuable metals separated and purified via dedicated refining steps. In some cases it can take more than one process or process step to change the chemical identity of the UVCB substance and trigger a change in its identity under REACH. A UVCB substance can hence be comprised of various 'versions' of the same substance, containing more or less constituents in lower or higher concentration.