



## Factsheet REACH & UVCBs

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### 1. How is a UVCB defined and identified under REACH?

Under REACH, any **substance** needs to be identified by a combination of the appropriate identification parameters:

- The IUPAC- and/or other name and other identifiers, e.g. CAS-number, EC-number;
- The molecular and structural information;
- The chemical composition.

A substance is completely identified by its chemical composition i.e. the chemical identity and the content of each constituent in the substance.

Substances of Unknown or Variable composition, Complex reaction products or Biological materials (**UVCB substances**) cannot be sufficiently identified by the above parameters, 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.

According to the ECHA Guidance for identification and naming of substances under REACH and CLP, the consequence of defining a substance as UVCB is that any significant change of source or process would be likely to lead to a different substance that should be registered again. However, reality in the metals sector sometimes demonstrates a same UVCB substance can originate from different sources and process (steps).

#### 1.1. Chemical composition

UVCB substances either cannot be uniquely specified with the IUPAC name of the constituents, as not all the constituents can be identified; or they may be generically specified but with a lack of specificity due to variability of the exact composition. Due to the lack of differentiation between constituents and impurities, the terms 'main constituents' and 'impurities' should not be regarded as relevant for UVCB substances.

However, the chemical composition and the identity of the constituents should still be given as far as known. Information on chemical composition can be given on the basis of well-known reference samples or standards; and in many cases indexes and existing codes can be used in addition. Other generic information on the composition can consist of so called 'fingerprints', that is, e.g. chromatographic or spectral images that show a characteristic peak distribution pattern.

For a UVCB substance, 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; the typical concentrations and concentrations ranges of the known constituents should be given as well. 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. Additives should be completely specified in a similar way to that described for well defined substances.



## 1.2. Main identification parameters: name, source and process

- **Name:** 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).
- **Source:** A substance derived from non-biological sources is identified by the starting materials, which have to be described with their IUPAC name in English language. Mineral sources have to be described in generic terms (e.g. primary material, secondary feeds, etc.).
- **Process:** Processes are identified by the type of chemical reaction if synthesis of new molecules is involved, or as a type of refinement step (e.g. smelting, refining, precipitation, etc.).

## 1.3. Hazardous properties and classification

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**.'

Reality in the metals sector, because of the varying composition of the sources from which UVCB are manufactured and the (combination and/or iteration) does however not always allow deriving one classification only but instead, several classification profiles.

## 2. UVCBs in the non-ferrous metal sector: more 'V' than 'U'

Within the non-ferrous metal (NFM) sector, many substances are identified as UVCBs. These are complex inorganic substances containing varying amounts of metals, metal compounds and/or minerals, which may occur naturally (e.g. mineral ores) or be manufactured during the various refining streams of the metal and mineral industry (e.g. inorganic intermediates). UVCB in the metals sector have a known composition but large spatial and temporal heterogeneity and variability in compositions and physical forms.

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.

The inorganic NFM UVCB substances are characterised by their 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.).

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. CuSO<sub>4</sub>, CuS, AgCl or PbSO<sub>4</sub>;
- 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.

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.

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.

## 2.1. 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.

## 2.2. 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.

### 3. How can the UVCB status of a substance be demonstrated?

In order to be considered a UVCB substance under REACH, a substance should:

- have a sufficiently variable and poorly predictable composition at registrant level and across registrants;
- have been grouped based on similar origin or source and/or similar processes or process steps and/or;
- have similar hazardous properties and classification to confirm sameness.