

Explanatory note on the classification of zinc concentrates.

Zinc concentrates are UVCB's, consisting of a zinc mineral (e.g. sphalerite- ZnS in most cases) with some other metals (e.g. Pb, Cd, Cu, Ni, As, ...) in lower concentrations. These metals are all bound to a varying degree into the minerals matrix, which results in a varying degree of potential for solubilisation of these metals in aqueous media. The hazard potential of the metals contained in the zinc concentrate should therefore take into account the capacity of the metals to be released. This capacity can be assessed in specific tests, e.g. a) the transformation/dissolution (T/D) test to check the capacity of metals to be released in aqueous media, and b) bio-solubility or "bio-elution" testing in artificial body fluid to estimate the release in the human body.

The classification of zinc concentrates has been calculated with the MeClas tool (Arche 2010), in which information was combined on 3 levels ("Tier 2" assessment): a) the metal content of the zinc concentrate, b) the mineral form in which the metals were present in the concentrate, and c) the results of transformation/dissolution testing and bio-solubility ("bio-elution") testing (see below).

Test results on zinc concentrates

For assessing the capacity of metals to be released from zinc concentrates in relation to environmental hazard and human health hazard, 5 sphalerite-based zinc concentrates have been tested covering a wide range of different metals, especially covering the observed range in Pb-content. Preliminary analysis had indicated that Pb-content is a main driver for zinc concentrate classification.

The ranges of the main relevant metals in these zinc concentrates were: Zn: 50.2-55.4%, Pb: 0.7-3.5%, Cd: 0.13-0.32 %, Cu: 0.08-2.4%, As: 0.01-1%.

These concentrates were tested for :

- a) Transformation dissolution in aqueous medium at pH 6 and pH 8 (7days) according to standard OECD protocol.

The capacity for solubilisation from the tested concentrates in aqueous medium varies considerably: Zn: 0.9-4.3%, Pb: 5.8-35%, Cd: 1.6-6.5%, Cu: 0.6-5%, Ni: 0-17%, As: 0.3-2%. These ranges were obtained at pH 6. At pH 8, lower values were observed. For assessing the classification of non-tested zinc concentrates, the maximum values of the mentioned ranges were applied in a conservative approach: Zn: 4.3%, Pb: 35%, Cd: 6.5%, Cu: 0.6%, As: 2% (no value applied for Ni) .

- b) In-vitro solubility in gastric fluid at pH 1.5 (2hrs) according to standard protocol (ASTM 5517-07)

In a worst case approach, bio-elution testing was performed on the zinc concentrate that showed the highest metal release in the T/D tests. The observed bio-elution rates for Pb (45%) and Ni (6.7%) were applied in the calculations

Remarks on other elements:

-Other elements may be present, but in non-significant concentration (e.g. Co, Mo, Sb, ...).

-quartz: zinc concentrates may contain SiO₂/quartz/silica in a typical concentration ranging between 1 and 5 %. Based on limited information, it is assumed that this silica is in the amorphous, non-crystalline form, so it would not result in classification. Crystalline SiO₂ has been self-classified for STOT RE. This issue will be clarified in the future. Most zinc concentrates will be classified STOT-RE cat 2 because of Pb-content.

Hg: can be present as a trace in zinc concentrate, however in very low concentration; the Hg is moreover present in the mineralogical xCdS.yHgS-form, which is exempted from classification.

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