Zinc oxide (ZnO)

Figure 1: © Image by Dimitris Vetsikas from Pixabay.

1. What is Zinc oxide?

Zinc oxide occurs either as colourless, hexagonal crystals or as a white, loose powder. It is insoluble in water and soluble in various acids with salt formation. Probably one of the most visually impressive properties of zinc oxide is its so-called thermochromism: When zinc oxide is heated, the previously white powder turns yellow. After the powder cools down it turns white again.

Although zinc oxide can also be found naturally as the coarse-grained mineral zincite, most of the zinc oxide used today is obtained synthetically.[1]

2. (Commercial) Use of the Material and its Applications

Zinc oxide is a versatile material. For example, it is used in pigments, in the semiconductor industry, as a catalyst or in medical environment. As nanoparticles it is used for example in cosmetics or as mineral UV filter in sun creams. The nanoparticulate zinc oxide ensures that the sunlight is reflected and thus prevents too much sunlight from penetrating the skin.

3. How can I come into contact with this material?

In normal everyday life we come into contact with zinc oxide mainly through our food and this is good, as zinc is essential for humans. Between 12 and 15 mg of zinc are taken in daily with the diet. Most of the zinc is present in the form of zinc oxide, which then dissolves in the body.

Zinc oxide is therefore primarily absorbed orally. Through cosmetics and sun creams our skin also comes into contact with zinc oxide. Welding work can also lead to the formation of ZnO vapours which are inhaled.

4. Relevance for risk governance

As already mentioned, zinc is essential for humans and nanoparticulate zinc oxide also has a positive effect, as zinc is needed in the body for many important biological processes or as a UV filter to protect against sunburn. In high doses or by inhalation of ZnO vapours, zinc oxide can also have a toxic effect. [2,3]

ZnO has been included as a substance in CoRAP (Community Rolling Action Plan) by the EU in 2015 under Regulation (EC) No 1907/2006 (REACH). The re-evaluations are planned from 2020.[4]

5. Experimental plan and goals within RiskGONE

Within WP5 ZnO is currently being used to critically evaluate the nano-specific applicability of a sub-set of existing *in vitro* methods required for hazard assessment to identify where adaptation is required to existing testing approaches. The experiments are being conducted in multiple partner laboratories simultaneously, to determine methodological adaptations are required to ensure the tests are appropriate for nanomaterial safety assessment. The *in vitro* methods to be focused upon during the first phase critical evaluation include the comet assay, the colony forming efficiency assay, the HPRT forward mutation assay and the micronucleus assay.

6. Reference Material in RiskGONE: Repository and ID

ZnO from sigma (#MKCJ4155)

7. References

[1] https://www.nanopartikel.info/en/nanoinfo/materials/zinc-oxide/overview

[2] Brown, JJ (1988), Br J Radiol, 61(724): 327-329.

[3] Kuschner, WG et al. (1995), J Investig Med, 43(4): 371-378.

[4] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table/-/dislist/details/0b0236e1807eb509