Material Characterization Report: Organ burden and pulmonary toxicity of nano-sized copper (II) oxide particles after short-term inhalation exposure

Introduction

This will be a report on the material characterizing preformed in Ilse Gosens et al. 2016. In the research conducted, Copper (II) oxide nano-particles (CuO NPs) were tested for organ burden effects on rats after a short-term inhalation exposure.

Reported characteristics

The raw CuO NP powder was obtained from PlasmaChem, GmbH. PlasmaChem reported: "crystalline material of size 15-20 nm, surface area of 47 m^2/g, and a density of 6.3 g/cm^3".[1]

A Transmission Electron Microscope (Tecnai 12 G2), with settings described in De Temmerman et al. 2014, was used to check the consistency with the aforementioned data. The TEM tests showed a particle size of 9.2-14 (first and third quartile), with a statistical mode of 10. The *X-ray-excited Auger electron spectroscopy* indicated an abundance ratios of 46% Cu, 47% O, and 7% C. An α parameter was also calculated from the results to be 1851.7 eV.

Surface charges wise, a ζ-potential of value (-5±0.4 mV) was measured indicating agglomeration and high instability of dispersions in a Gamble and ALF solutions (lung-fluid simulating environments).

After assessing the lungs of the rats for 30 days, the team concluded that "the CuO NPs do not follow the kinetics of poorly soluble particles."[1]

Missing information

The X-ray spectroscopy showed some Carbon contamination. Any further analysis for the carbon was not found, but I am not sure if it was warranted with carbon being 7% of the sample.

The paper also mentioned a "non-negligible presence of hydroxides of copper"[1], but it did not elaborate on it with any further information. No mention of crystal structure nor shape was found.

Conclusion

Overall, Ilse Gosens et al did a reasonably good job characterizing the CuO they used. There were a few bits of information missing, but that could most probably be attributed to my shallow experience and inability to connect some dots.

[1] Organ Burden and Pulmonary Toxicity Of Nano-sized Copper (ii) Oxide Particles After Short-term Inhalation Exposure, Ilse Gosens-Flemming Cassee-Michela Zanella-Laura Manodori-Andrea Brunelli-Anna Costa-Bas Bokkers-Wim Jong-David Brown-Danail Hristozov-Vicki Stone - Nanotoxicology - 2016