Engineered nanoparticle-containing consumer products in the Singapore retail market and likelihood of release into the aquatic environment

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We recently inventoried consumer products in the Singapore retail market with regard to their likely contents of engineered nanoparticles (ENP). These products were further assessed regarding their potential for releasing ENP into the aquatic environment. For this we attributed to each product type usage patterns. By estimating release factors, we obtained approximate quantities of ENP that are released into the aquatic environment in Singapore. In total 1,432 products were investigated. Of these 138 were "confirmed" and 293 were "likely" to contain ENP. Product types in these categories included sunscreens, cosmetics, health and fitness, automotive, food, home and garden, clothing and footwear, and eyeglass/lens coatings. The ENP confirmed or likely to be contained in these products included SiO2 (predominant), followed by TiO2, ZnO, Carbon Black, Ag, and Au. The amounts released into the aquatic environment were in the range of several hundred tons per year. We are currently modelling the aquatic environment in Singapore to describe in more detail the fate of these ENP after their release.

Comparing the Venturi and rotating drum dustiness testing methods

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During production and downstream use of nanomaterials there is inherent potential for workers to be exposed to nanoscale particulate, with inhalation exposure of primary concern. Open dry powder handling, product harvesting and clean-up operations, significantly contribute to worker exposures. Several factors may influence the degree to which a worker may be exposed, one of which is the powder dustiness. Dustiness may be defined as the propensity for a powder to aerosolize under a prescribed stimulus. Dustiness testing should replicate the dispersal mechanism that results in fugitive airborne dust. One of the most widely recognized dustiness methods is the EN15051 rotating drum, which replicates many general powder handling and transfer operations. One limitation of the drum, is that it requires ~100 g of powder for testing. A method such as the Venturi, which uses ~30 mg of powder, has been successfully applied to nanomaterials.

Numerous fine and nanoscale powders have been tested by both the Venturi and rotating drum methods and mean average dustiness data compared. Although there are significant differences between the underlying dispersal mechanisms for the two testing methods, both of which are observed in the workplace, there appears to be good correlation between dustiness derived from the two methods. Further powders are required for a more definitive comparison.