

## **SN applied sciences**

### **Nano-enabled products in South Africa and the assessment of environmental exposure potential for engineered nanomaterials**

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#### **Abstract**

In order to address risks associated with nanotechnology, there needs to be improved understanding of potential sources of engineered nanomaterials (ENMs) into the environment. Nano-enabled products (NEPs) are amongst such sources, and the current study identified NEPs sold in South Africa as a means of examining their potential to emit ENMs into the environment. Two hundred and sixty-four products were identified, mainly from the health and fitness category (66.7%), followed by electronics and computers (15.2%), home and garden (10.6%), appliances (3.8%), automotive (2.7%) and food and beverage category (1.1%). The chemical identity of ENMs was reported in 62.8% of those products with the top five most common being ENMs (in the descending order) Ti, C, Ag, Si and bisoctrizole. Determining the NEPs environmental exposure potential indicated that 63.6% exhibited high exposure potential comprising predominantly health and fitness, personal care, cosmetics and clothing products. The priority NEPs in terms of environmental exposure were sunscreens, hair relaxers, moisturising lotions, eye creams, cosmetic sera and socks. Assessed through analytical examination, NEPs were found to contain ENMs with length and width ranges of 15–350 and 8–185 nm, respectively. Our study suggests that most NEPs sold in South Africa pose a high potential for nanopollution, with water resources as the highest risk. Mandatory labelling of NEPs is recommended in order to better estimate the extent of nanopollution arising from usage of the NEPs.