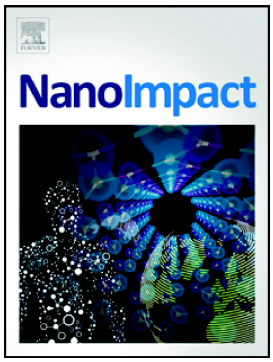

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Dermal transfer quantification of nanoparticles from nano-enabled surfaces

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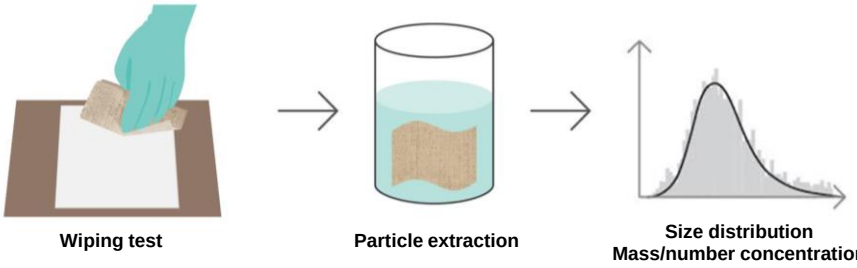
Graphical abstract



Abstract

Engineered nanoparticles are used in various applications due to their unique properties, which has led to their widespread use in consumer products. Silver, titanium, and copper-based nanoparticles (NPs) are a few of the commonly used nanomaterials in surface coatings, mainly due to their biocidal, optical, or photocatalytical properties. The knowledge concerning potential dermal exposure to nanoparticles from nanoparticle-enabled surfaces is currently lacking, partly due to analytical challenges. The aim of this study is to perform dermal wiping tests on nano-enabled surfaces and characterize NP release from keyboard covers and freshly painted surfaces, in terms of mass and number concentration, as well as released particle size distribution through the use of spICP-MS. Three types of NPs were selected for method validation testing, Ag, TiO_2, and CuO; and, the particle extraction from wipes was found to be efficient for Ag and CuO, but not for TiO_2 particles. Thereafter, potential dermal transfer was tested by wipe sampling for two nanoAg-containing silicon keyboard covers, and wood painted with nanoCuO-containing paint. AgNP release was observed for one of the keyboard cover types, with around 5000 particles/cm^2 (corresponding to 0.002 ng/cm^2) dislodged from the matrix after 3 wiping events. CuO NP release was 20000 particles/cm^2 (0.885 ng/cm^2) from the freshly painted surface, and magnitudes higher after the paint