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Inhalation exposure and dermal deposition of airborne particles during electrostatic spraying of liquid TiO₂-based nanocoating

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Abstract: Exposure assessment models are increasingly being used for regulatory purposes. Risk assessments should cover all potential exposure routes where inhalation, ingestion and dermal are most common pathways for uptake. Here, we measured particles dispersion and deposition during electrostatic spraying of liquid coating product containing TiO₂ nanoparticles in a 20 m³ chamber. The ventilation rate was 0.5 h⁻¹ while the temperature and relative humidity was 23 °C and 50 %, respectively, corresponding to typical indoor environment atmospheric conditions. Surfaces of tiles and wallpaper (2 m²) were sprayed for 15 and 150 seconds to mimic low and high exposure, respectively. A near field, far field, and breathing zone size-resolved concentrations were measured with a time resolution of 1 second. For electron microscopy analysis, we collected samples of deposited particles from walls, floor, and worker knee, hand, and face. This will show relative particle deposition on the worker when compared to the chamber surfaces. Preliminary results show that the air was fully mixed inside the chamber after few seconds from the start of spraying. Thus, here the particles dispersion can be described with a single zone model. This study will be used in parameterization of the inhalation and dermal exposure assessment model.

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