

# **Ecotoxicological effects of aged exterior paint particles on terrestrial biota**

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Microplastic (< 5 mm) pollution has recently generated increasing attention due to its widespread prevalence and adverse effects. Microplastics are typically produced from household plastic products such as polyethylene terephthalate bottles or polyethylene bags, but they can be generated from sources that are less obvious, including paint. Despite the massive worldwide consumption of architectural paint, the ecotoxicological effects of aged exterior paint particles on terrestrial biota remain largely uncharacterized.

Herein, the toxic effect of aged paint particles on the soil environments was assessed using the nematode, *Caenorhabditis elegans* as a test organism. Different types of paint particles were generated by fragmentation and sequential sieving of paint coatings collected from two old residential areas. The paint particles exerted different levels of toxicity, as indicated by a reduction in the number of *C. elegans* offspring, depending on their size, color, and layer structure, and these physical structures were highly linked with chemical heterogeneity of additives in the paint particles. The toxic effect of the paint particles was partially attributed to two heavy metals, As and Cu. The toxicity of leachable additives in the paint particles was also assessed by serially washing the paint particles with distilled water and ethanol. Ethanol washing of the paint particles reduced the soil toxicity of hydrophobic additives. Liquid chromatography-mass spectrometry revealed that the ethanol leachate of the paint particles contained alkyl amines, concentrations of which had a high correlation with the toxicity of the paint particles. Collectively, our findings provide insights into the potential hazards of aged paint particles and their additives in the terrestrial environment.