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Leaching of microplastics from PVC pipes under stagnant conditions

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ABSTRACT

The commonly used household plumbing pipes are made of polyvinyl chloride (PVC) pipes. However, there are concerns regarding their role as source of microplastics (MPs) in the water supply system. This study aimed to investigate the leachability of MPs from PVC pipes under stagnant conditions. Laboratory experiments were conducted in PVC pipes to simulate MP leaching at varying pH, chlorine doses, and stagnation times. Water samples from the experiments were tested for different water quality parameters, including MPs using standard procedures. The total organic carbon concentration in the water samples increased with stagnation period indicating that organic substances including MPs were leaching from the pipes. The concentration of leached particles as well as the MPs count increased with stagnation period. A strong correlation was found between the MPs count and the mass concentration of leached particles retained on the filter papers leading to the conclusion that most of the leached particles were MPs. Attenuated total reflectance-Fourier-transform infrared spectroscopy analysis showed peaks associated with C–Cl and C–H bonds that are typical for PVC suggesting that particles retained in the filter are likely PVC microplastics. Scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy analysis identified particles that have elemental compositions like that of PVC further strengthening the conclusion that MPs were leaching from the PVC pipe.

Keywords: Microplastics; Leaching; Stagnation; Polyvinyl chloride pipes

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