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# Fate of polystyrene and polyethylene nanoplastics exposed to UV in water

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## Abstract

The possible presence of plastic particles with diameters smaller than a  $\mu\text{m}$  in the aquatic environment raises widespread concern over their environmental impact. Therefore, it is important to understand whether and to what extent nanoplastics dispersed in water degrade under UV irradiation. To address this issue, we studied the effect of UV irradiation on monodisperse polystyrene (PS) latex particles ( $R=0.1\text{-}2.5\ \mu\text{m}$ ) and polydisperse polyethylene (PE) particles ( $R=0.35\ \mu\text{m}$ ). All particles were found to fully degrade with a degradation rate of PS particles much faster than that of PE particles. Light scattering measurements showed that the molar mass of the particles decreased by more than 70% without changing the radius indicating that degradation mainly occurred within the particles through the release of organic molecules, see figure 1(top). The formation of hollow particles and a decrease of their size are confirmed with CLSM microscopy, see figure 1 (bottom) before their complete disappearance. TOC measurements showed that the degradation of PS particles lead to the complete conversion of all the initial organic carbon possibly into volatile products suggesting that the ultimate fate of PS nanoplastics and small microplastics after exposition to UV may no longer be in the aquatic environment. Please see the supplementary file for figure 1.

**Keywords:** Nanoplastics, microplastics, nanoparticles, UV irradiation, induced degradation, polyethylene, polystyrene

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