



OCCURRENCE OF MICROPLASTICS IN WASTEWATER TREATMENT PLANTS

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Abstract

Microplastics have become an emerging concern as they are hazardous to the environment, organisms as well as to human. Wastewater treatment plants have been identified as a possible source of microplastics. The present study was to evaluate the abundance, composition and removal efficiency of microplastics in six wastewater treatment plants. Samples were collected in three random visits to each treatment plant. Effluent and influent samples were collected using 200 μ m, 500 μ m and 1 mm sieves and sludge samples were also collected. All samples were subjected to wet peroxide oxidation to extract microplastics. Microplastics were detected in all the samples studied. Those were analysed based on their shape (fiber, fragments, foam, and film/sheet), size (>1mm, 1mm-500 μ m and 500 μ m - 200 μ m), and color. Abundance of microplastics in influent, effluent and sludge was 1100 - 66500 items per m³, 2 - 2960 items per m³ and 4365 - 12280 items per kg respectively. Four out of six wastewater treatment plants investigated showed more than 98% microplastics removal efficiency. Daily discharge of microplastics into the aquatic environment was observed to range between 3000 to 26,595,000 items per day. Fibers were the dominant microplastic type in both influent and effluent waters (> 55% and >56%, respectively). More than 50% of microplastics were in the size range 200 μ m - 500 μ m in influent and > 1mm in the effluent, indicating smaller the particles (200 μ m - 500 μ m), higher the removal efficiency (99.13% - 99.58%). Raman spectroscopy showed that Polyethylene and Polyethylene terephthalate were the major polymer types found in wastewater. It can be concluded that the wastewater treatment plants can retain more than 98% of microplastics in the wastewater and serve as point source due to large daily discharge of treated effluent. Prevention of releasing of microplastics into the environment is important as microplastics cause ecosystem and human health impacts mainly due to the potential transfer via food chain and toxicity effects.

Keywords: *Effluent, Influent, Microplastics, Wastewater treatment plant*