

Abstract

Microplastics (MPs) are plastic polymers classified in the size range of 5 mm to 1 μm . MPs are emerging pollutants with the potential to cause health hazards to humans and the environment. Wastewater treatment plants (WWTPs) serve as secondary sources for MP contamination in the environment.

- We investigated the physical and chemical characteristics of MPs from four WWTPs in Deep East Texas using optical microscopy (bright-field microscopy) and spectroscopic techniques (scanning electron microscopy/Energy dispersive X-ray (SEM/EDX) and Fourier transform infrared spectroscopy (FTIR)).
- The most common shapes of MPs were in the order: fragments (396 ± 181 MPs/L) > filaments (131 ± 102 MPs/L) > rods (52 ± 58 MPs/L) > beads (17 ± 29 MPs/L) > fibers (17 ± 44 MPs/L).
- Wastewater samples contained an average of 610 ± 252 MPs/L.
- FTIR spectra indicates the presence of polyvinyl chloride ($\nu(\text{C-H}) = 2918$), ($\nu(\text{C-Cl}) = 639 \text{ cm}^{-1}$), polyethylene ($\nu(\text{C-H}) = 2932 \text{ cm}^{-1}$), ($\nu(\text{C-H}) = 2892 \text{ cm}^{-1}$), polypropylene ($\nu(\text{C-H}) = 2919 \text{ cm}^{-1}$), ($\nu(\text{C-C}) = 1156 \text{ cm}^{-1}$), and nylon ($\nu(\text{N-H}) = 3350 \text{ cm}^{-1}$), ($\nu(\text{C=O}) = 1670 \text{ cm}^{-1}$).
- Concentrations of elements carbon, oxygen, and chlorine in SEM-EDX spectra indicate presence of MPs. Many WWTPs discharge treated water into nearby creeks and biosolids are incorporated into soil. Thus, WWTPs are sources of MP contamination in the aquatic and terrestrial environments. The ubiquitous nature of MPs in the environment can negatively impact the functions of plants, animals and humans leading to a significant public health concern.