Spatiotemporal Variations of Microplastics in the Tsurumi River and their Relationship with Environmental Factors

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Abstract:

In recent years, the problem of microplastic pollution with the longest diameter of less than 5mm has been receiving tremendous attention. However, current microplastic measurement methods require time-consuming and labor-intensive sample pretreatment, instrument setup and complex data processing. Therefore, this study suggests an alternative analytical method with a Fenton treatment and a TOC analysis. The purpose of the study was to perform the microplastic quantitative analytical method using a TOC analysis and to estimate the spatiotemporal changes of microplastics and their relationship with environmental factors in the Tsurumi River, Yokohama, Central Japan.

Water samples were collected and analyzed with the number, the longest diameters and polymer types of microplastics at 5 sites and 5 different depths throughout the Tsurumi River in August 2023, November 2023, February 2024 and May 2024. Samples were filtered, treated with a Fenton reagent, and analyzed using a Fourier transform infrared spectrometer and a TOC analyzer.

Microplastic concentrations sized 300µm-5mm showed 0.03 to 6.4 particles/m^3 in the Tsurumi River. Besides, microplastic concentrations sized 1-300µm were estimated at 1 to 128 mg C/m^3. Five microplastic polymer types were determined as PE, PVC, PP, Nylons and PS. In addition, the most common polymer types were PE, PVC and PP.