Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17816

Novel Single-Particle Analytical Technique for Inhalable Airborne Microplastic Particles by the Combined Use of Fluorescence Microscopy, Raman Microspectrometry, and SEM/EDX

YOOJIN LEE, MR. HANJIN YOO AND **CHUL-UN RO**

Inha University, Department of Chemistry

Presenting Author: curo@inha.ac.kr

This study presents a novel and efficient method for analyzing inhalable airborne microplastics (AMPs) in ambient PM_{10} aerosols. Although many studies have been conducted on microplastics in a variety of environments, the physicochemical characteristics of AMPs of inhalable size (<10 μm) in ambient PM_{10} are poorly understood because of the lack of suitable analytical methods. The method employed in this study combines fluorescence microscopy, Raman microspectrometry (RMS), and scanning electron microscopy/energy dispersive X-ray spectrometry (SEM/EDX) for an efficient and reliable investigation of inhalable AMPs, which constitute a just a very small portion of ambient PM_{10} aerosol particles. Fluorescence microscopy and staining are used to select particles with high microplastic potential from ambient urban PM_{10} aerosols. The combination of RMS and SEM/EDX then allows for a detailed characterization of these particles on a single-particle basis. The results of the study show that ~0.008% of the particles collected using a PM_{10} sampler had high microplastic potential, corresponding to ~800 particles/m^3. Among the stained particles of < 10 μm, 27% were determined to be plastic while the remaining 73% were found to be from tire/road wear. The number of inhalable AMPs was estimated to be 192(±127) particles/m^3. This study provides important insight into the characteristics of inhalable AMPs in ambient PM_{10} aerosols that are particularly critical in respect of human health and climate change. The authors highlight that the use of a single fluorescent staining method can overestimate the number of inhalable AMPs in ambient air by including tire/road wear particles. To the best of their knowledge, this is the first study to demonstrate the morphological and spectroscopic characteristics of the same individual inhalable AMPs.