MICROPLASTICS – FAST AND RELIABLE IDENTIFICATION USING CORRELATIVE SPECTRO-MICROSCOPY

Iryna Danylo[1], Petr Marvan[2], Zdeněk Sofer[2], Jana Kofroňová[3], Radek Vurm[3] and **Martin Veselý[1]**

[1]Department of Organic Technology, University of Chemistry and Technology Prague, Technická 5, 166 28 Prague 6, Czech Republic
[2]Department of Inorganic Chemistry, University of Chemistry and Technology Prague, Technická 5, 166 28 Prague 6, Czech Republic
[3]Department of Environmental Chemistry, University of Chemistry and Technology Prague, Technická 5, 166 28 Prague 6, Czech Republic

Nowadays, one of the global issues is plastic and microplastic pollution, which is particularly emerging in all types of waters such as wastewater, rivers, and drinking water. However, a fast and reliable assessment of microplastic pollution poses challenges. Here, we present a methodology of correlative hyperspectral imaging of a narrow-pore filter, which is used to collect all the solid particles from the liquid sample on the filter surface. The correlative hyperspectral imaging, which combines low-resolution Raman mapping and high-resolution Scanning Electron Microscope coupled with Energy-dispersive spectrometer (SEM-EDS), rigorously determines microplastics' concentration, size, shape, and chemical nature. The key novelty stays in the methodology of correlative analysis, which means collecting both Raman and SEM-EDS from the exact same position on the sample, with post-acquisition data and image analysis. We used Principal Component Analysis (PCA) and clustering with Gaussian Mixture models to determine the chemical nature and rough spatial position of the microplastics, and intensity-based identification and contour-based thresholding of individual microplastic particle in the correlative SEM image to determine shape and size. This methodology is presented both for a model sample and a sample from a river. The methodology successfully identified microplastics even in the presence of other solid materials such as diatoms and shells, which naturally occur in river water. Therefore, our methodology seems to be a fast and reliable method to identify microplastics collected from the water by filtration over a filter.