The application of Raman mapping for the analysis of blended microplastics

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Abstract

Single-type polymers such as Polyethylene (PE), Polypropylene (PP), and Polystyrene (PS) have been mainly the target of studies on the analysis of microplastics (MPs) in the environment. Nevertheless, a large number of polymers having different industrial applications are typically mixed in the form of blends to improve their physicochemical characteristics. Considering the long-time use of blended polymers, a big portion of MPs derived from these polymers could pollute the environment. Here, we demonstrate the application of Raman mapping for the analysis of blended MPs (B-MPs) composed of Low-Density PE (LDPE) and PP with weight ratios of 75% and 25%, respectively. Raman mapping is performed with two excitation wavelengths (532 nm and 785 nm) in confocal mode and using a line-shaped laser beam profile (line-focus). Concentration estimate analysis is done to evaluate the amount of each polymer present in the mapping area, and the results are quantitatively compared using a parameter called concentration estimate error (CEE). It is shown that applying laser line focus can reduce the required time of Raman mapping for visualizing the morphology of the distribution of polymers within B-MPs.

Keywords: Blended microplastics, Raman spectroscopy, Concentration estimate analysis

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