Do Polymer Interactions Impact the Accuracy of Microplastic Quantification in Mass Spectrometry-Based Analysis?

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3.22.T-05 Do Polymer Interactions Impact the Accuracy of Microplastic Quantification in Mass Spectrometry-Based Analysis?

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Microplastic (MP) pollution is an increasing global concern, with MPs detected in air, water, soil, and biota. Accurately quantifying these microplastics is challenging due to sample variability and the absence of standardized methods for analyzing polymer mixtures. A critical challenge is selecting reference materials that reliably replicate the decomposition behaviour of environmental polymer mixtures. Most studies focus on individual polymers to identify decomposition markers and develop calibration curves; however, this approach does not consider the complex interactions found in environmental samples where multiple polymers are co-pyrolyzed. These interactions may lead to secondary reactions, potentially introducing systematic errors in quantitative analyses. This challenge is particularly evident in thermoanalytical techniques such as TED-GC/MS and PY-GC/MS, where the co-pyrolysis of polymers can interfere with accurate quantification. This study investigates the impact of polymer interactions on thermal degradation fingerprints using thermogravimetric analysis coupled with gas chromatography and mass spectrometry (TGA-GC/MS). Various polymer combinations, including polystyrene (PS), polyethylene (PE), polyethylene terephthalate (PET), polyamide-6 (PA6), styrene-butadiene rubber (SBR), polyvinyl chloride (PVC), and polypropylene (PP), are analyzed with two different internal standards to evaluate their co-pyrolysis behaviour. Preliminary results indicated that increasing PS concentrations reduce the abundance of internal standard (poly(4-fluorostyrene)) monomer while promoting trimer formation, highlighting significant polymer interactions. Final results, expected by March 2025, aim to investigate specific fingerprints to prevent analytical errors caused by polymer interactions in MP quantification. Identifying polymer interactions and understanding their chemistry is crucial to avoid interferences and improve the accuracy of microplastic analysis.