Microplastic Recovery and Characterisation in *Mytilus galloprovincialis* Tissue Using Enzymatic Digestion and µFT-IR Imaging

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Abstract:

This study evaluates the use of enzymatic digestion combined with µFT-IR imaging for the recovery and characterization of polymer particles from *Mytilus galloprovincialis* tissue. Frozen mussel tissue was artificially spiked with reference particles of HDPE, PA, PVC, and PET and subjected to enzymatic digestion using Kreon®25000. The digestion protocol removed 99.8% of the biological matrix, enabling subsequent filtration, microscopic observation, and spectroscopic analysis. A total of 2334 particles were detected. Recovery varied among polymers, with HDPE showing the highest numerical recovery and PET the lowest. HDPE, PA, and PVC were dominated by particles smaller than 50 µm, whereas PET particles were generally larger. Morphological analysis showed that most particles had irregular fragment-like shapes. µFT-IR imaging revealed heterogeneous spatial distribution and clustering patterns on filter surfaces. Comparison between ATR-FTIR reference spectra and µFT-IR spectra obtained after digestion confirmed preservation of the characteristic polymer bands. The results demonstrate that enzymatic digestion combined with µFT-IR imaging is a reliable and polymer-preserving approach for microplastic analysis in marine biological matrices.

Keywords:

Microplastics, enzymatic digestion, *Mytilus galloprovincialis,* µFT-IR imaging, polymer recovery, marine biota, particle size distribution, polymer identification.