RESEARCH ARTICLE

Biodegradable Nanoplastics Detection in Marine Ecosystems Using Surface-Enhanced Raman Spectroscopy

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Published: 2026-05-01 | GAST

Abstract:

This study develops a novel surface-enhanced Raman spectroscopy (SERS) method for detecting and characterizing biodegradable nanoplastics in marine environments. We fabricated silver nanoparticle-decorated graphene oxide substrates that enable detection of polylactic acid (PLA) and polyhydroxyalkanoate (PHA) nanoplastics at concentrations as low as 10 ng/L. Field validation in three marine sampling sites confirmed the method's reliability, revealing previously undetected nanoplastic contamination in deep-sea sediments. Our findings challenge the assumption that biodegradable plastics pose minimal environmental risk in marine ecosystems.