

Tracking Micro- and Nanoplastics: An Overview of Analytical and Spectroscopic Technologies

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Abstract:

Micro- and nanoplastics (MNPs) have emerged as a pressing global concern due to their ubiquity in the environment, their occurrence in food and water, and the potential risks they may pose to human health. Reliable detection and quantification of these particles remain technically challenging because of their small size, diverse morphologies, and presence in complex sample matrices. A range of analytical techniques has been developed for MNP characterization, including visual, spectroscopic, and mass spectrometry-based methods, each with distinct strengths and limitations.

This presentation will provide an overview of the current state-of-the-art in MNP detection technologies, with particular emphasis on Raman and surface-enhanced Raman spectroscopy (SERS). These vibrational spectroscopic methods offer powerful capabilities for particle identification and chemical fingerprinting, and their combination with microscopy and portable platforms creates opportunities for both laboratory and field applications. Key challenges such as sample preparation, standardisation, and data interpretation will also be discussed, alongside perspectives on how innovations in SERS substrates and instrument miniaturisation can accelerate progress towards practical monitoring solutions.

This talk will provide an overview of current opportunities and persistent challenges in developing robust strategies to track and assess MNPs in food and environmental systems.