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Identification of microplastics using Raman spectroscopy: latest developments and future prospects

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Abstract

Widespread microplastic pollution is raising growing concerns as to its detrimental effects upon living organisms. A realistic risk assessment must stand on representative data on the abundance, size distribution and chemical composition of microplastics. Raman microscopy is an indispensable tool for the analysis of very small microplastics (< 20 μm). Still, its use is far from widespread, in part due to drawbacks such as long measurement time and proneness to spectral distortion induced by fluorescence. This review discusses each drawback followed by a showcase of interesting and easily available solutions that contribute to faster and better identification of microplastics using Raman spectroscopy. Among discussed topics are: enhanced signal quality with better detectors and spectrum processing; automated particle selection for faster Raman mapping; comprehensive reference libraries for successful spectral matching. A last section introduces non-conventional Raman techniques (non-linear Raman, hyperspectral imaging, standoff Raman) which permit more advanced applications such as real-time Raman detection and imaging of microplastics.