Exploration and application of Confocal Laser Raman Spectroscopy in marine microplastics

J. LIU, Z.F. DU, X. ZHANG*, Z.D. LUAN, J. YAN

CAS Key Laboratory of Marine Geology and Environment, Center of Deep Sea Research, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, 266071, China (liujing17@mails.ucas.ac.cn; *corresspondence: xzhang@qdio.ac.cn)

Application in Particle from Marine Organisms

We applied confocal laser micro-Raman spectroscopy in marine organism after digestion so as to prove the effectiveness of micro-Raman technology in identifying microplastics (Fig. 1).

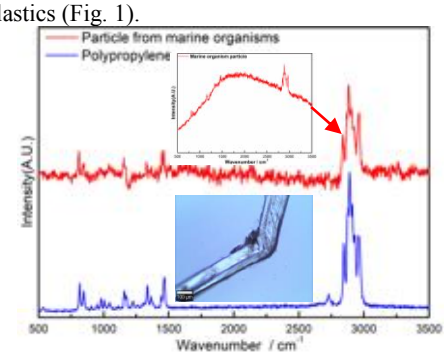

Figure 1: Raman spectrum of marine organism particle in comparison with established standard spectrum of PP

Lab Simulations of Rapid Detection Method

Current identification methods lack standard procedure; besides, complicated pretreatment is required for particles. To establish a rapid detection method that classifies polymers in various matrices, simplified experimental steps need to be completed in the laboratory.

PE and PP particles (100 mesh) were mixed with surface mud of the Yellow Sea (1:200g) for a week, under laboratory conditions, without the chemical digestion process, lest that should degrade plastic polymers; after density flotation, samples were filtered with a 5μm filter membrane, and subsequently, Raman spectra were obtained. The CH/CH2/CH3 stretching groups, when compared with the established standard polymer library in a 2780-2980 cm-1 range, instantly helped identify the polymer types. This confirms effective detection and identification of microplastics via Raman technology. However, the limitations of micro-Raman spectroscopy in plastic size still necessitate research and exploration, and further studies would involve reduced (1μm or nanoscale) particle size, in laboratory simulations. The final goal is to establish in situ detection methods of microplastics in marine environment.