Fundanmental parameters for detection of Microplastics based on hyperspectral imaging

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Plastic has become one of the most common materials in daily applications of human life in the past decades. Ingestion of plastic particles and pieces were found in the marine ecosystem from micro-to-small lives such as plankton, corals, mussels to large animals such as turtles and cetaceans. It is preliminarily considered that many plastics will behave over geological timescales. Consequently, the accumulation of plastics in the ocean would become an inevitable issue. Microplastics are plastic particles < 5 mm in diameter. With their large surface area to volume ratio, adsorption of waterborne pollutants, such as aqueous metals, endocrine disrupting chemicals and persistent organic pollutants on microplastics added another threat to the food chain. Despite recent concerns by various levels of policy-makers, scientific communities and the public, one of the fundamental recognition, the current situation of microplastic pollution in the marine ecosystem, is still less understood. Aiming to characterize marine microplastics based on hyper-spectral imaging techniques, we examined the fundamental spectral features of microplastics over as much as wide range of 11 polymertypes in the wavelength range of 900 to 1700 nm. Toward the application of hyper-spectral imaging techniques to automatic detection of microplastics in seawater filtrations, we examined various membrane filters to propose appropriate candidates for filtration stage background. We also report the innovatively optimized hyper-spectral imaging system in which small microplastics down to the size range of 100 μm was able to detect by improving lighting and focal lengths.

Keywords: Microplastic, Hyperspectral imaging, Substrate filter

