

# A study on the method of measuring microplastic standard samples using FT-IR imaging

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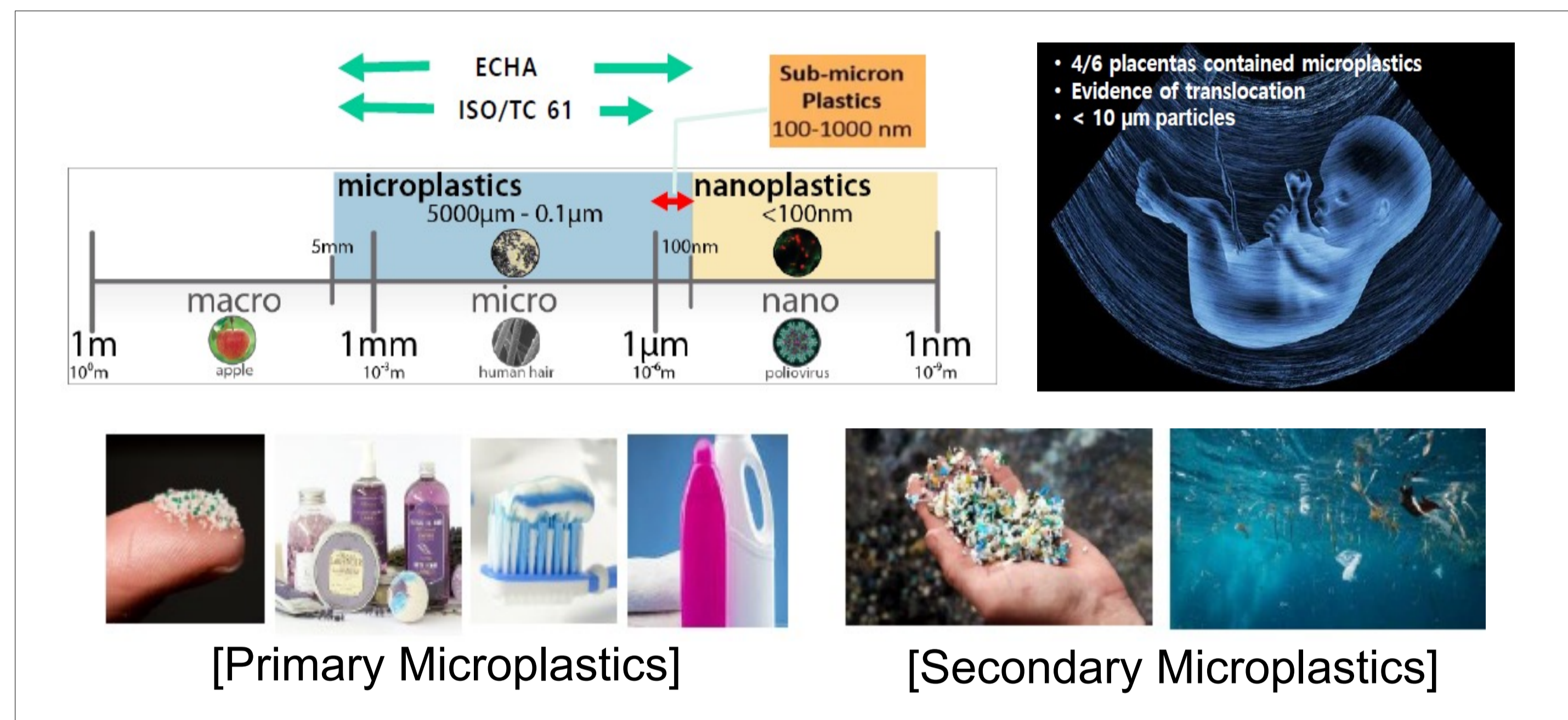
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## Introduction

Microplastic (MP) refers to small plastic particles of less than 5 mm and is generated production (primary) or physical and chemical decomposition (secondary) in existing plastics. MP, a high molecular compound composed of organic matter, is a material that does not decompose well and accumulates in the environment and living organisms. It has been continuously reported polluting the environment that microplastics are spreading from the ocean to rivers, air, soil, etc. Recently, there has been a report that microplastics from marine organisms to the human placenta have been discovered, and controversy continues over the safety issue of MP. However, extraction and detection methods of microplastics that were spread in various environments have not been established. Among various methods for detecting MPs in a specific target, there is a method using Fourier-transform infrared spectroscopy (FT-IR) imaging equipment. This method has the advantage of extracting a specific IR signal of microplastic by matching the IR signal to an image. Finally, it can identify the size, shape, and number of particles. Before detecting microplastics using IR equipment, it is necessary to calibrate the microplastics to improve the detection performance and reliability. To stable the basis for measuring microplastics, library spectral data for experimental conditions are required. Based on spectra, it is required that various MP-related characteristics extraction and application tests. In this study, transmission spectrum data was extracted from PE, PET, PMMA, and PP standard samples. And it checked detection performance and characteristic wavelengths. Based on this result, we will collect more MPs that standard materials and generated from environments.

## Microplastics(MP)?

- Small plastic particles of **less than 5 mm**
- Primary MP**: Generated production  
ex) cosmetics, tires, synthetic textiles, plastic pellets, etc.
- Secondary MP**: physical and chemical decomposition in existing (larger) plastics  
ex) soda bottles, fishing nets, plastic bags, etc.



- Recently announced the possibility of **accumulation in the body**
- Possible accumulation of MP in **crops** through **soil**  
→ **Safety issue of MP**

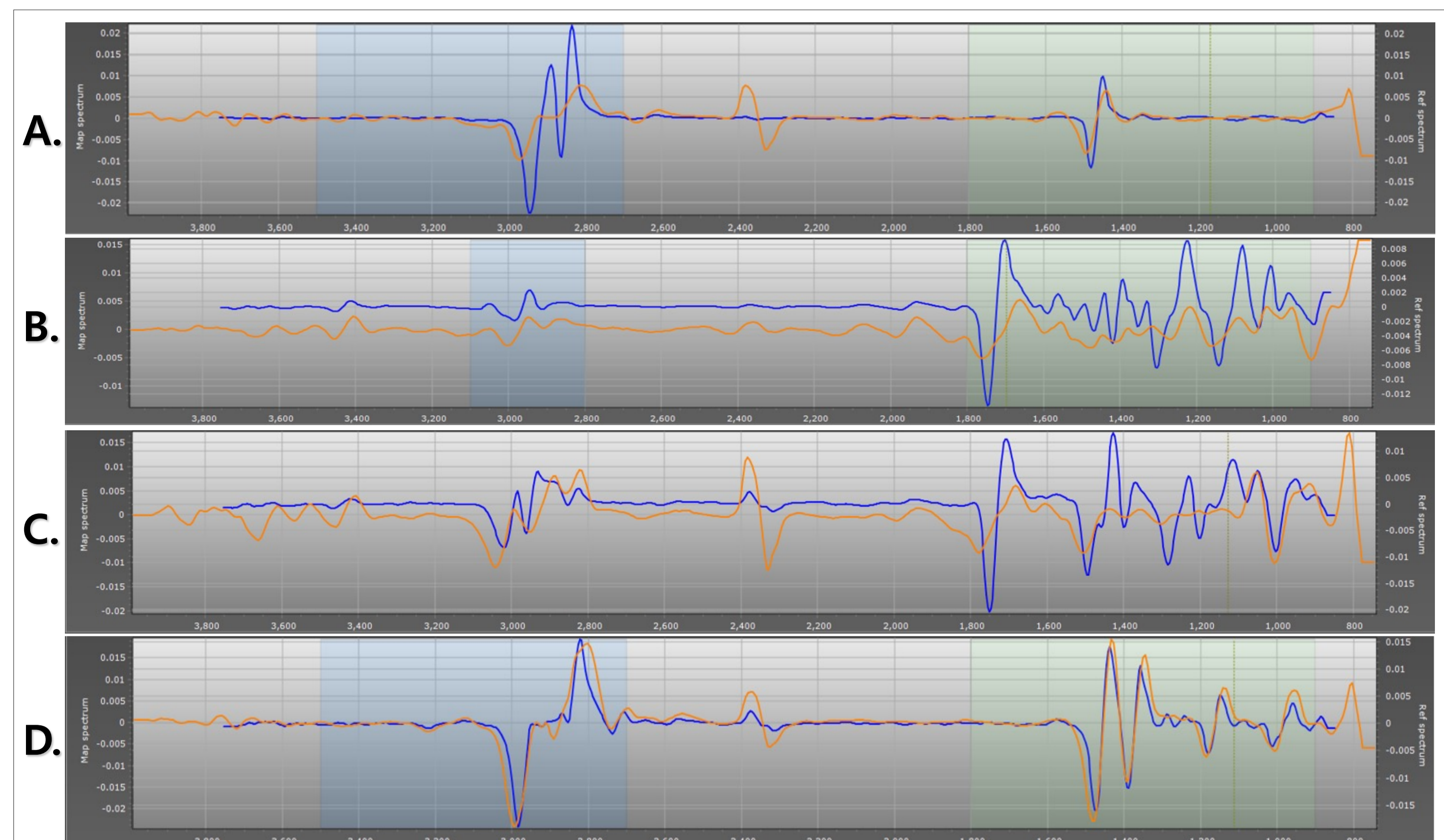
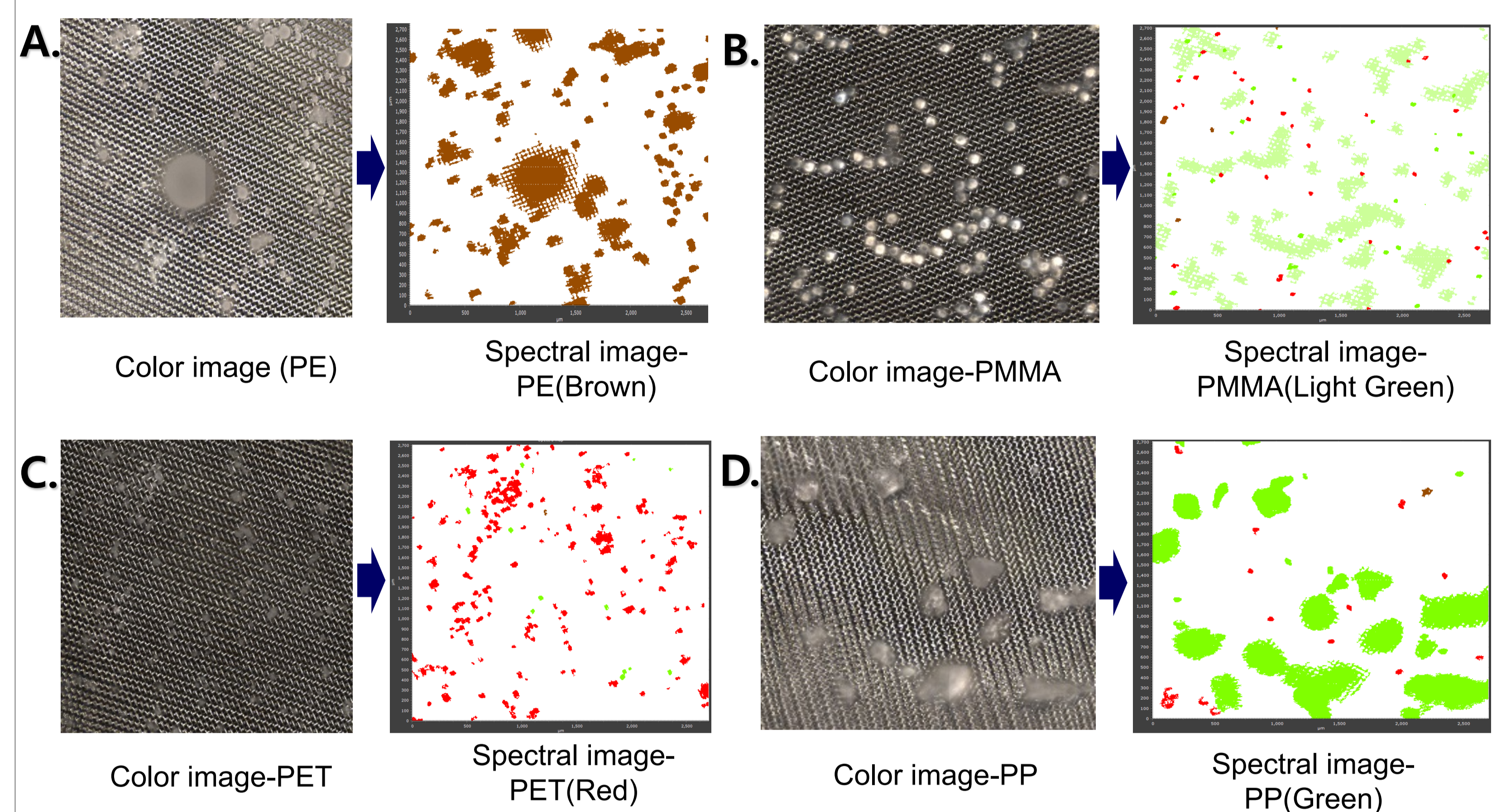


- For the detection of microplastics, conducting basic research.
- Attempt to measure microplastic standard samples using FT-IR equipment

## Materials and Methods

- FT-IR microscope system(LUMOS II, Bruker Optik GmbH, Germany)**
  - Spectral range( 7000 ~ 670  $cm^{-1}$  ), 2  $cm^{-1}$  spectral resolution
  - Using transmission measurement mode
  - Stage: Motorized xy sampling stage, adjustment range: 75x50mm, adjustment accuracy: 0.1  $\mu m$
- Filter**: STS filter, diameter 27 mm, mesh size – 20  $\mu m$
- Standard Microplastics**
  - Polyethylene (PE) : 710 ~ 63  $\mu m$  (Cospheric, US)
  - Polyethylene terephthalate (PET) : 174  $\mu m$  (BAM, Germany)
  - Polymethyl Methacrylate (PMMA) : 106  $\mu m$  (Cospheric, US)
  - Polypropylen (PP) : 174 ~ 47 $\mu m$  (BAM, Germany)

## Result



- When using siMPle's own library, the detection accuracy is very low (less than about 60%)
- There is a difference between the library and the actual measurement data, and it is different depending on the measuring equipment and the applied filter, so registration is required (accuracy was increased by about 90% or more)
- We plan to continuously register the library by collecting MP standard samples and environmental samples.

## Acknowledgement

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