Application Note
100MT0256

Microplastics Identification by IR Imaging Measurement

Introduction

Plastic debris in marine environment has become a serious concern in recent years, impacting health & safety and environmental ecosystems. Microplastics have been found in fish, shellfish, bottled water and more recently salt from marine sources. Microplastics are generally defined as particles smaller than 5 mm. The amount, type of plastic and impact on natural ecosystem are actively being investigated. These plastics, which are difficult to observe by the naked eye, are assumed to originate from additives in cosmetics, such as facial cleansers, toothpastes, or from the break up of larger plastic materials during long periods of drifting in the oceans.

IRT-7200 and FT/IR-6600

The objective of this application note is to demonstrate IR microscopy as an effective and rapid assessment tool to identify and characterize microplastics in water. Using IR microscopy, microplastics can be measured without elaborated pretreatment, and the type of plastic can be easily identified using FTIR databases. In addition, using IR imaging, it is possible to calculate the distribution ratio and measure the particle size.

Keywords

FTIR, Microplastics

JASCO INC.
28600 Mary's Court, Easton, MD 21601 USA
Tel: (800) 333-5272 Fax: (410) 822-7526
Application Library: jascoinc.com/applications

Experimental

Measurement Conditions	
Instruments	FT/IR-6600 Fourier transform infrared spectrometer IRT-7200 Multichannel infrared microscope
Measurement Mode	Transmission
Detector	Linear array detector
Resolution	8 cm-1
Accumulation	16 times
Measurement Area	800 x 800 µm
Measurement Points	64 x 64 points
Measurement Time	about 15 minutes

Results

Fig. 1 shows spectra obtained by IR imaging measurement with database search results, Fig. 2 is the microscopic image of the measured area and Fig. 3 is the chemical image created from the key band peaks indicated by red and green arrows.

As a result of the database search, it was found that the plastics in the microscope image are polystyrene (PS) and polyethylene terephthalate (PET). A Teflon peak was also detected in the spectrum this was from the Teflon sampling filter. The distribution of each plastic component was shown by creating a chemical image from key functional groups.

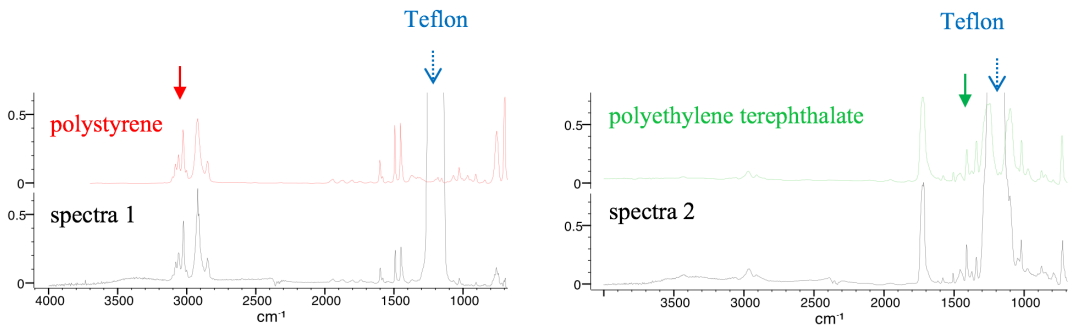

Figure 1. Representative spectra and database search results.

JASCO INC.
28600 Mary's Court, Easton, MD 21601 USA
Tel: (800) 333-5272 Fax: (410) 822-7526
Application Library: jascoinc.com/applications

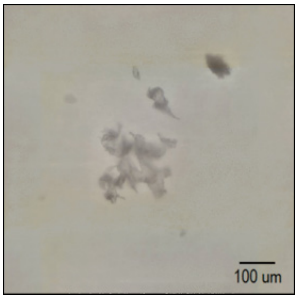

Figure 2. Microscopic observation image.

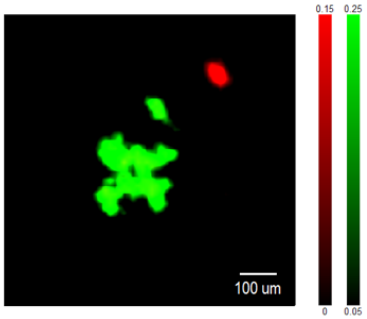

Figure 3. Chemical image.

Conclusion

Two different type of plastics were identified using IR imaging measurement.

Currently, microplastics are generally defined as particles of less than 5 mm, but analysis of microplastics at even smaller sizes is also required. The measurement with IR microscopy is typically recommended for particles of more than 10 µm, and Raman microscopy is more effective for particles smaller than 10 µm.

JASCO has developed a convenient accessory called IQ frame that can measure exactly the same observed area easily and quickly with both IR and Raman microscopes, the combination of these complementary analytical techniques is expected to become an effective analysis methodology.

JASCO INC.
28600 Mary's Court, Easton, MD 21601 USA
Tel: (800) 333-5272 Fax: (410) 822-7526
Application Library: jascoinc.com/applications