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Application News

No. A529

Spectrophotometric Analysis

Fluorescence Measurement of Glass and Plastic

Introduction

In observations and analyses with a fluorescence microscope or Raman spectroscopy instrument, the objects used to contain or fix samples in place are often made with common items such as glass and plastic. While glass and plastic are convenient from the perspective of workability and durability, these materials can affect measurement data if they have fluorescent properties themselves.

This article introduces the results of examining the presence and absence of fluorescence in glass and plastic objects using the RF-6000 spectrofluorophotometer.

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3D Fluorescence Spectra Measurement of Glass and Plastic Objects

Fig. 1 and Fig. 2 show the types of samples we measured. The glass samples consist of a glass marble, uranium-glass marble, glass cell, and quartz cell. The plastic samples consist of films of polyethylene (PE) and polypropylene (PP), sheets of polyvinylchloride (PVC), polyethylene terephthalate (PET), and polymethyl methacrylate (PMMA), and a PMMA sheet treated with fluorescent coloring. Each sample was set on a solid sample holder and measured according to the conditions listed in Table 1.

Table 1 Measurement Conditions

Instrument used	:	RF-6000
Options	:	Solid sample holder, IHU310
Spectrum type	:	3D spectrum
Measurement wavelength range	:	Ex 280 nm to 600 nm Em 310 nm to 600 nm
Scanning speed	:	6,000 nm/min
Wavelength interval	:	Ex 5.0 nm, Em 1.0 nm
Bandwidth	:	Ex 5.0 nm, Em 5.0 nm
Sensitivity	:	Low

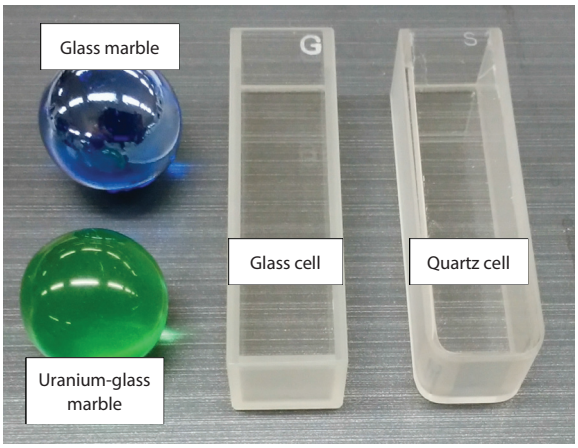

Fig. 1 Glass Samples

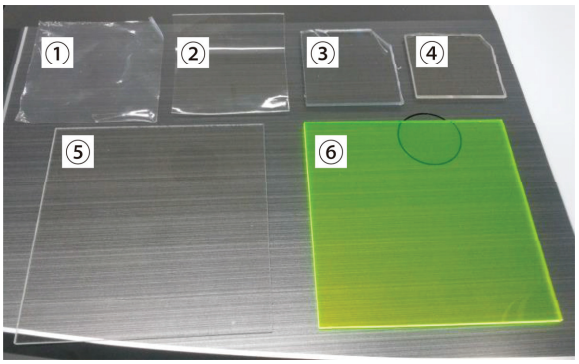

Fig. 2 Plastic Samples
1: PE, 2: PP, 3: PVC, 4: PET, 5: PMMA, 6: PMMA (Fluorescent Coloring)

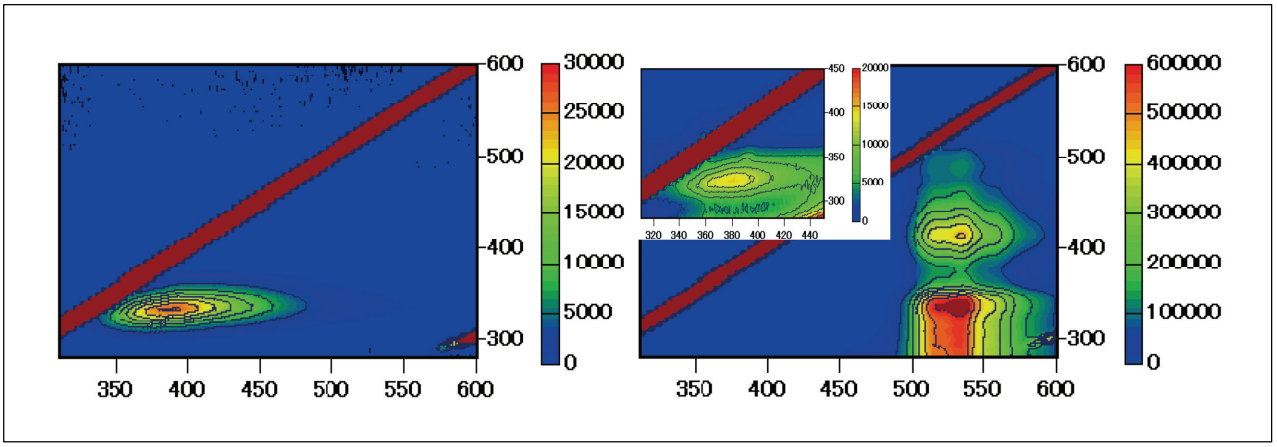

Fig. 3 3D Fluorescence Spectra Left: Glass Marble, Right: Uranium-Glass Marble

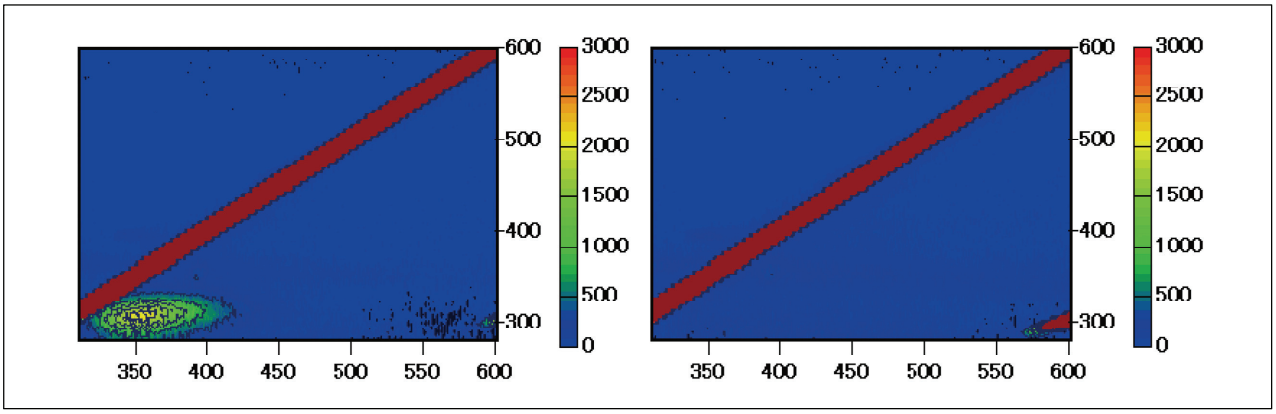

Fig. 4 3D Fluorescence Spectra Left: Glass Cell, Right: Quartz Cell

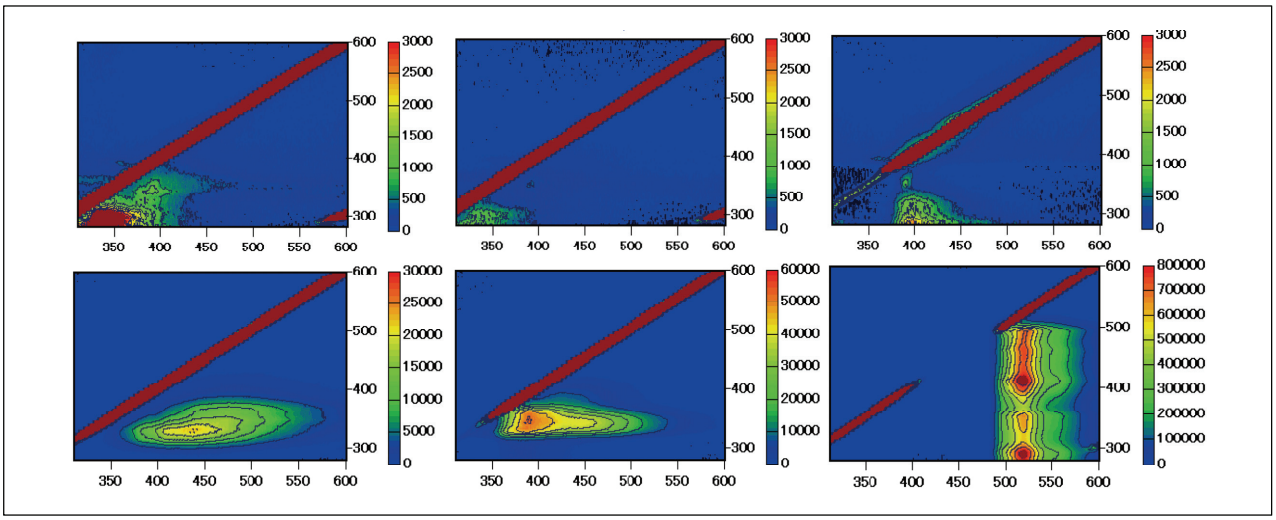

Fig. 5 3D Fluorescence Spectra
Upper Left: PE, Lower Left: PVC, Upper Center: PP, Lower Center: PET, Upper Right: PMMA, Lower Right: PMMA (Fluorescent Coloring)

Fig 3. to Fig 5 show the results of 3D fluorescence spectrum measurement. For the excitation wavelength range of 310 nm to 340 nm, the glass marble showed fluorescence in the 350 nm to 450 nm region and the uranium-glass marble showed fluorescence from uranium in the 500 nm to 600 nm region in addition to fluorescence from glass. However, while the glass cell showed faint fluorescence in the 330 nm to 400 nm region for the excitation wavelength range of 290 nm to 320 nm, the quartz cell did not exhibit fluorescence.

For the plastics, PE and PP showed faint fluorescence around 340 nm for the excitation wavelength of 300 nm. PVC showed fluorescence centered around 440 nm for the excitation wavelength of 330 nm and PET showed a different fluorescence centered around 390 nm for the excitation wavelength of 350 nm. Even without fluorescent coloring treatment, PMMA showed faint fluorescence in the 380 nm to 450 nm region for the excitation wavelength of 300 nm. On the contrary, the yellow PMMA treated with fluorescent coloring showed intense fluorescence in the 500 nm to 550 nm region [*1].

Summary

In this research, we examined the presence and absence of fluorescence in various glass and plastic objects using the RF-6000 spectrofluorophotometer. We were able to confirm the presence and absence of fluorescence and differences in excitation and fluorescence wavelengths between samples. The ability to ascertain the presence of fluorescence in glass and plastic objects helps to determine its effect on measurement data in advance when using a fluorescence microscope or Raman spectroscopy instrument.

*1 The observed fluorescence is not guaranteed since the measured samples are commercially available items.

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