Application Note

280-TC-0001

Q. What can be done if IR microscope is combined with heating stage?
A. Melting or phase transition of the sample in terms of heating or cooling can be evaluated in molecular level.

Differential Scanning Calorimetry(DSC) or Thermo Gravimetric Analysis(TGA) is generally, used as an evaluation method for thermophysical properties such as melting or phase transition of the sample . In addition, combination with X-Ray Diffraction(XRD) is sometimes used for the multiple evaluation of thermophysical properties and crystal structure.
JASCO's IR microscope, IRT-5000 and 7000 combined with the heating system, MHC-5000 (Fig. 1, Chart 1) which we are now introducing enables to have an integrated approach to the geometry change in molecule itself, or the thermopysical properties and the observation image. It can uniformly heat or cool the measurement area in IR microscope because the measurement area is much smaller than FTIR, assuring high accuracy measurement. You can easily control the temperature and the measurement conditions by interval measurement program of temperature through the PC. Scanning of sample image is available with the sample measurement at the same time.

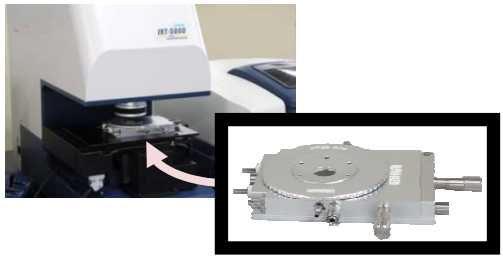

Fig.1 IRT-5000 and heating stage

Chart 1. Temperature control range of heating stage

Model	MHC-5000	(option)
Temperature range	Room temperature ~ 600 ºC	-190 ~ 600 ºC

<Measurement>

Using the system of IRT-5000 with MHC-5000, benzoic acid was heated from 100 ºC up to 150 ºC with ramping rate of 2 ºC per minutes and IR spectra were obtained with 0.5 ° C intervals.
Fig. 2 shows 3-Dimensional spectra of benzoic acid with changes in temperature, Fig. 3 shows the change of peak intensity at 930 cm^{-1} against temperature change and Fig. 4 shows observation image the benzoic acid with the change of temperature from 120 to 125 ° C. Viewing these figures, the structural changes and the condition of the benzoic acid were confirmed at around 120 ºC to 125 ºC. Since the melting point of the benzoic acid is 122.4 ºC*, the molecular structure and its condition change due to melting was clearly seen through this system. It can be concluded that this system is applicable for the measurement of structural changes with heating, such as denaturation of proteins or hardening process of thermoset resin.

*Ref.Cyclopedia of chemistry

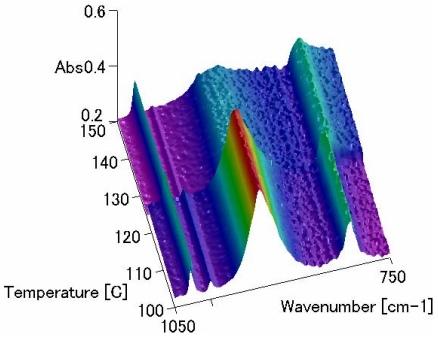

Fig. 2 3D spectrum of benzoic acid

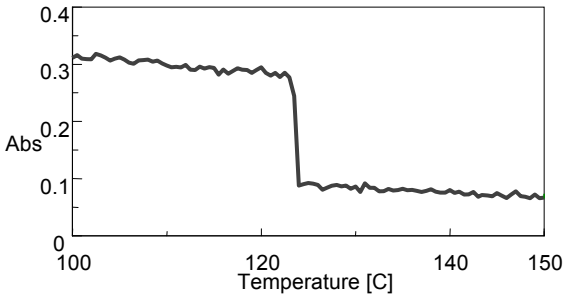

Fig. 3 Change of peak intensity at 930 cm^{-1}

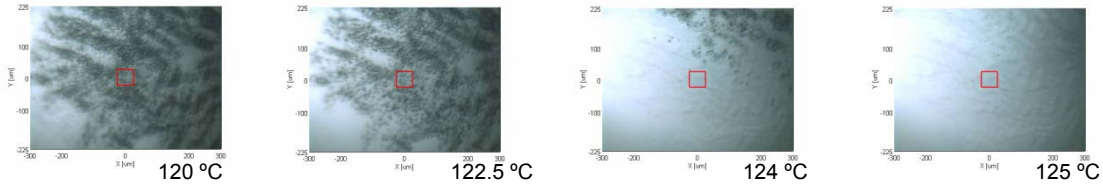

Fig. 4 Observation image of benzoic acid in each temperature(☐measurement area)

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