SHIMADZU APPLICATION NEWS
LAAN-A-TA-E000A
● THERMAL ANALYSIS
No. T134A

Application of Photovisual DSC

Photovisual DSC is a differential scanning calorimetry (DSC) system with a transparent quartz glass window in the furnace cover to permit direct observations of changes in the sample status during measurements. A microscope and CCD camera offer magnified images in realtime. These images can be stored, if required. This system is effective for confirming the sample status corresponding to the endothermic and exothermic peaks obtained by DSC.
This Application News introduces examples of the application of Photovisual DSC, particularly to foods and drugs.

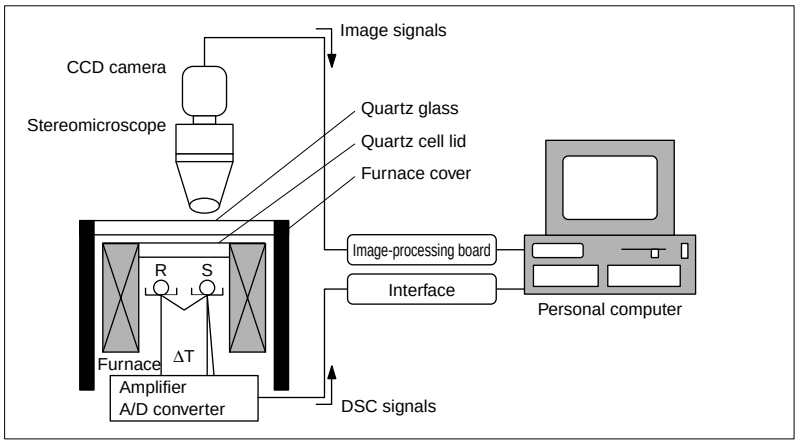

Fig.1 System Configuration of Photovisual DSC

Fig.2 Photovisual DSC

■ Measurement of Margarine

Margarine was sampled in an aluminum cell and heated from -70˚C. A feature of this system is the ability to operate in the subzero temperature region and to observe samples undergoing DSC while cooled by a coolant, such as liquid nitrogen. Fig. 3 shows the results of DSC measurements on margarine. Multiple endothermic peaks are observed due to the melting of the oils and fats in the margarine. Fig. 4 to Fig. 6 show the sample status at the positions indicated by the arrows.

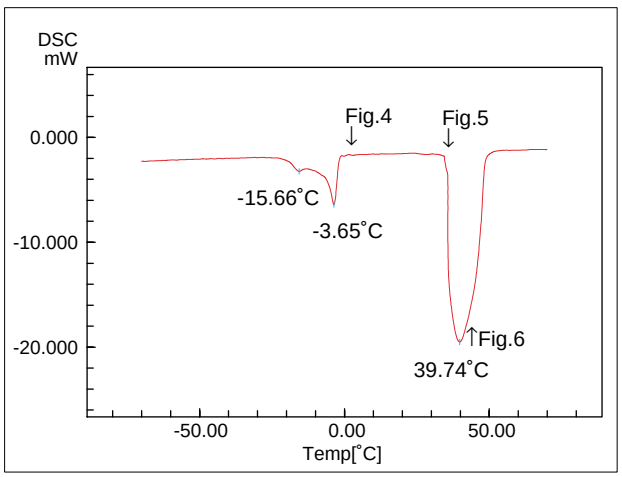

Fig.3 DSC Curve for Margarine

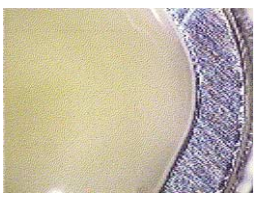

Fig.4

Fig.5

Fig.6

■ Measurement of Sulfathiazole

Fig. 7 shows the result of a DSC measurement from the heating of sulfathiazole after it is pulverized in a mortar and pestle. Sulfathiazole exists in many crystal forms. The peak near 157˚C is thought to be a crystal transition from Form 3 to Form 1. The peak at 202˚C is thought to result from the melting of Form 1. Fig. 8 to Fig. 10 show images of the sample during heating. Observations before and after the 157˚C peak (thought to be a crystal transition) indicate no difference in the sample status. After the peak at 202˚C, the sample has melted to a liquid.

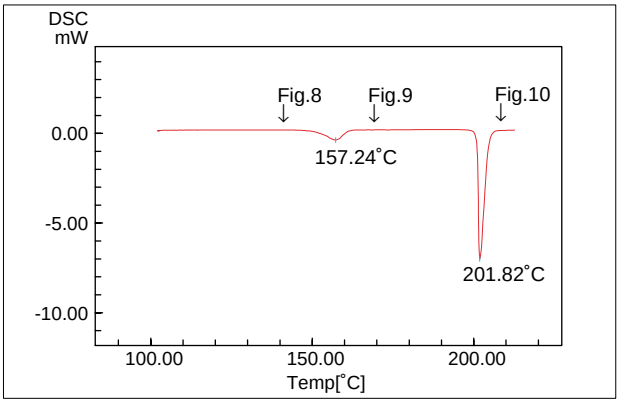

Fig.7 DSC Curve for Sulfathiazole

Fig.8

Fig.9

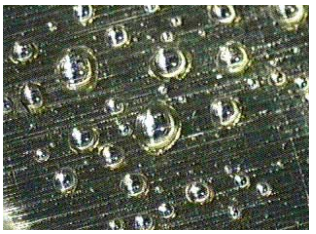

Fig.10

■ Measurement of Whisky

Fig. 11 shows a DSC measurement result from heating whiskey chilled and frozen at -120˚C. The endothermic peak at -66˚C is due to ethanol and the endothermic peak at -26˚C is thought to result from the melting of water. The white cloudy areas increase due to the melting of ethanol at -66˚C, as shown in Fig. 13 and 14. Subsequently, the sample becomes transparent after the water melts at -26˚C, as shown in Fig. 15 and 16.

The white cloudiness is believed to result from separation of a liquid phase within the solid phase due to the melting of ethanol.

The irregular lines apparent in Fig. 12 are due to cracking of the frozen sample.

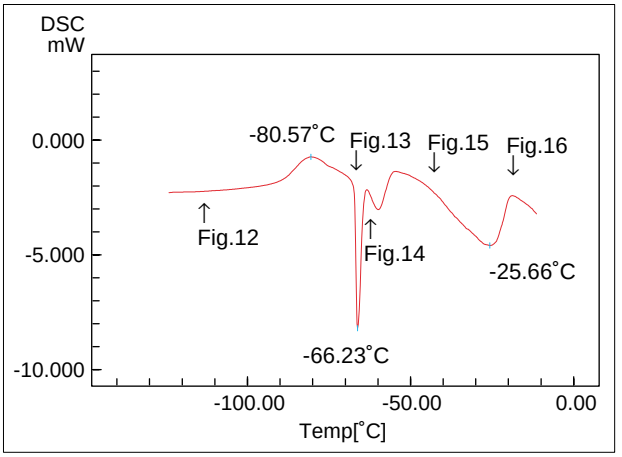

Fig.11 DSC Curve for Whisky

Fig.12

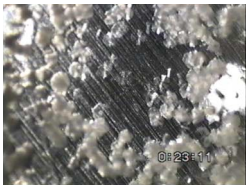

Fig.13

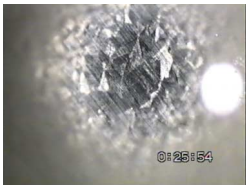

Fig.14

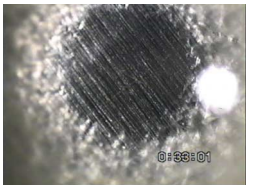

Fig.15

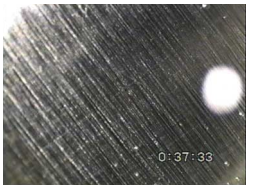

Fig.16

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