Visualization of Smallest Energetic Effects by Means of a High Sensitivity DSC Sensor

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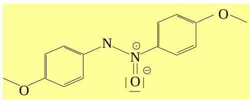
Differential Scanning Calorimetry (DSC) is a very well established method for the characterization of materials such as polymers, food, pharmaceuticals etc.

The enormous variety of information describing the sample behavior like melting, decomposition, chemical reaction or purity, are important values for quality control, optimization of the production process or improving of the performance of newly developed materials.

The sensitivity of DSC equipment and its sensors, respectively, is the key for quality and significance of the achieved analytical results [1].

For investigating smallest energetic effects, like the liquid crystal transition of 4,4´-Azoxyanisole, a highly sensitive setup is required.



4,4´-Azoxyanisole

DSC 204 *Phoenix*®

µ-Sensor

Fig. 1: DSC 204 *Phoenix*®

Therefore 4,4´-Azoxyanisole can be used as a tool to prove the sensitivity of DSC sensors, as mentioned by van Ekeren et al. [2].

When employing the DSC 204 Phoenix® with the µ-Sensor (fig.1) the transition anisotropic liquid crystal to liquid of only 2.4 J/g can be detected (fig. 2).

Smallest amounts of Indium (150 µg) heated with 1 K/min still lead to an excellent resolution and peak to noise ratio when using the µ-Sensor as depicted in figure 3.

Denaturation reaction of a protein solved in a buffer is shown in figure 4. When the concentration of the protein is reduced by a factor of 50 (100mg/ml to 2mg/ml) the full information concerning enthalpy and peak temperature can still be evaluated (insert fig. 4). Figure 5 shows strong signals of phase transitions of (*R*)-4-[(1-Methylhepty-loxy)-carbonyl]phenyl 4′-octyloxy-4-biphenylcarboxylate (MHPOBC). The enthalpy of all four peaks is only 0.25 mJ/mg.

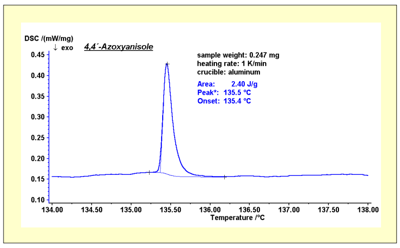


Fig. 2: 4,4´-Azoxyanisole, anisotropic liquid to liquid phase transition

References:

[1] S. Knappe, E. Kaisersberger, M. Schmidt, LaborPraxis Oktober 2000, 70-72.

[2] P.J. van Ekeren, C.M. Holl and A.J. Witteveen, Journal of Thermal Analysis, 49 (1997) 1105-1114.

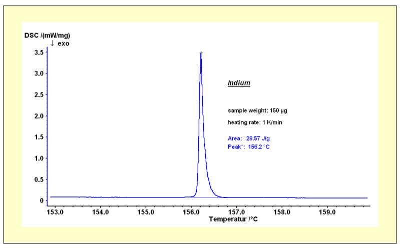


Fig. 3: Melting of 0.150 mg of Indium at a heating rate of 1 K/min

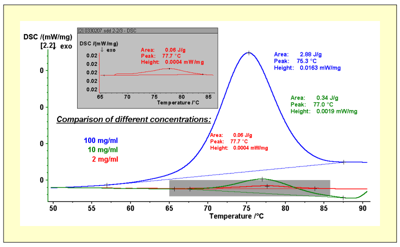


Fig. 4: Denaturation of a protein with different concentrations

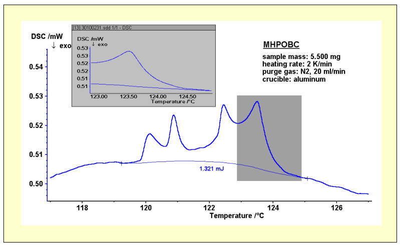


Fig. 5: MHPOBC, phase transitions, liquid crystal to liquid phase