Differential scanning calorimeter (DSC)

The current Perkin Elmer Pyris Diamond DSC was installed in 2002. It is a power compensation-type DSC, i.e., the heat flow difference required to heat the sample and a reference pan at a certain rate is measured. The sample can be investigated in either a temperature ramping or isothermal mode. In our Institute DSC is usually used to investigate polymer transitions, such as glass transition temperatures and melting transitions. If suitable pans are used, it can also be used to investigate, for example, reaction isotherms. The application of DSCs is naturally not limited to polymers. Generally, it can be used to investigate any material which exhibits a transition as a function of temperature. Such materials include chocolate, cosmetics, metals etc.

Our DSC is equipped with liquid nitrogen cooling so that temperatures down to approximately -170°C can be investigated. As we use aluminium pans, the upper limit to the temperature range is 600°C. The DSC allows scanning rates of between 0.01 and 500°C/min. However, typical scanning rates range from 5 to 40°C/min. Generally, slower scanning rates improve the peak resolution while faster scanning rates improve sensitivity.

Temperature range	Approximately -170 to + 600°C (with aluminium pans)
Ramp rates	Typically: 0.1 - 40 °C/min (see main text) (the maximum controlled cooling rate possible depends on the head-sample temperature difference, size of sample and purge gas)
Sample size	Pan sizes 10 to 50µL i.e. typical polymer samples: approx. 5 to 20 mg
Purge gas	Argon

References:

"Calorimetry: Fundamentals and Practice", W. Hemminger, G. Höhne, 1984, Verlag Chemie GmbH

Differential Scanning Calorimetry: An Introduction for Practitioners", G. Höhne, W. Hemminger, H.-J. Flammersheim, 1996, Springer Verlag Berlin

"Introduction to Thermal Analysis", M.E. Brown, 1988, Chapman and Hall, London

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