

Calorimetry as a Complement to the DSC Technique for Polymer Characterization

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Abstract

Differential Scanning Calorimetry (DSC) is a technique in which heat flow - or "power" - to the sample is monitored against time or temperature while the temperature of the sample, in a specified atmosphere, is monitored. It is widely used for, among other applications, characterization of polymers - glass transition, melting, amorphous content etc.

Usually, very small sample amounts are used, typically a few milligrams contained in a special crucible. This places some limitation on the technique's usefulness for studying interactions and effects of mixing different components.

Calorimeters are based on the same general principles as DSC but, having followed different development paths, tend to be used for different aspects of analysis. For example, the larger volumes of calorimeter cells, usually several millilitres, allow for larger sample amounts to be analysed and the wide variety of cells which are available allows interaction studies to be performed under a range of operating conditions.

This paper will present some examples in which calorimetry can provide useful information not available from DSC due to the limitations mentioned above. These will include heat of mixing of polymers via the Hess's law cycle, heat capacity determinations for low density materials and characterization of polymer solutions at very low scanning rates.