Differential scanning calorimetry (DSC)

Aims:

Thermal analysis of polymers, phase transition (glass transition, melting transition), characterization of polymers by thermoanalytical behavior investigation.

Task:

Investigation of the thermal behavior of three different commercially available polymers (yoghurt cup, cling film, grocery bag) with the DSC (under guidance of the assistant).

Practical application:

Accurate weighing out and preparation of samples of three standard polymers (available in the laboratory) under the guidance of the assistant. Transact of three DSC-measurements. Make sure that liquid nitrogen is available for the measurements. If not inform the assistant early enough!!!

Analysis:

1. Plot the obtained measurement data for PS (yoghurt cup) in a diagram and determine the glass temperature and compare it with literature results.
2. Plot the obtained measurement data for both polyethylenes (chemical box, grocery bag).
3. Determine the melting and glass temperature of both polyethylenes and compare them with literature results.
4. Determine the degree of crystallinity of both polyethylenes (complete crystallized PE has an transition enthalpy of ca. 280 J/g).

Additional questions:

I) What are the different types of polymers with regard to their thermal behavior? What are typical temperatures for polymers? Compare the different types of polymers!

II) Do you get a correct melting temperature from DSC? Which parameters of the melting transition are used and why?

III) What can be reasons for the difference between experimental results and literature results?

IV) Which influence does the morphological structure of a polymer have on the application properties? Discuss especially thermoplastics (morphology, application properties and application temperature) and compare them to elastomers!

V) What are the differences between HDPE and LDPE: What is the meaning of HDPE and LDPE? How are they synthesized? Why do they have a different melting point?

Assistant:

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