

DIFFERENTIAL SCANNING CALORIMETRY

Laboratory equipment

1. Differential scanning calorimeter DSC-7 “Perkin Elmer”
 - The instrument operates in both isothermal and linear programmed temperature mode.
 - Investigated temperature range: from 50 to 600 °C (standard).
 - Heating/cooling rates: from 0.2 to 200 K.min⁻¹.
 - Atmosphere: oxidative (air, oxygen) and/or inert (helium, nitrogen, argon).
2. Data acquisition and control (DAC) computer
 - DAC acquires the heat flow data in dependence of temperature or time.
 - DAC involve appropriate software to operate in different regimes.
3. IBM compatible PC for data evaluation and data analysis
 - The data are transferred from DAC to IBM compatible PC.
 - The data analysis of experiments is based on different software, e.g. MS Excel.
4. Balance, 10 µg
5. Additional devices: purge gas system(s)
6. Subambient accessory: external refrigerator of the sample holder (up to -60 °C).

Measurements and methods

1. Standard heat flow measurements:
 - Determination of temperature and heat of first order transitions (melting, crystallization);
 - Specific heat measurements.
2. Special tests and analytical methods:
 - Determination of dissolution heat and dissolution monitoring tests;
 - Purity determination of organic substances;
 - Characterization of second order transitions, e.g. glass transition;
 - Identifying and characterization of polymer blends;
 - Monitoring of phase changes and chemical reactions;
 - Kinetics of phase transitions;
 - Kinetics of chemical reactions.

Investigated systems and methods applied

1. Early research:
 - Thermal characterization of polyethylene, polypropylene, polyethylene terephthalate and polyamide-6;
 - Isothermal and non-isothermal kinetics of polyolefines crystallization;
 - Thermal characterization of poly(ethylene oxide) copolymers and blends;
 - Non-isothermal kinetics of nitrocellulose explosives;
2. Recent studies:
 - Isothermal kinetics in epoxy systems;
 - Non-isothermal kinetics in epoxy systems.

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