Differential Scanning Calorimeter (DSC, OIT)

Description

Differential Scanning Calorimetry by AHP

Differential Scanning Calorimetry (DSC) investigates how the heat uptake or release of a sample material changes in comparison to a reference material when both are subjected to a controlled temperature change. This technique is very useful for determining Phase Transitions. The term phase transition (or phase change) is most commonly used to describe transitions between the solid, liquid, and gaseous states. Phase transitions such as melting and crystallization. Crystallization is the physical process of hardening during the formation and growth of crystals. During this process, the heat of crystallization is released.

Applications for Differential Scanning Calorimetry

Differential Scanning Calorimetry (DSC) is a vital technique across various industries, offering critical insights into the thermal properties of materials. Our advanced DSC solutions ensure precision and reliability for diverse applications:

Polymers and Plastics:

- **Applications:** Determining Glass Transition Temperature. The glass transition is one of the most important properties of amorphous and semi-crystalline materials, e.g., inorganic glasses, amorphous metals, polymers, pharmaceuticals and food ingredients, etc., and describes the temperature region where the mechanical properties of the materials change from hard and brittle to more soft, deformable or rubbery glass transition temperature, Melting Temperatures and Enthalpies. The enthalpy of fusion of a substance, also known as latent heat, is a measure of the energy input, typically heat, which is necessary to convert a substance from solid to liquid state. The melting point of a substance is the temperature at which it changes state from solid (crystalline) to liquid (isotropic melt). melting point, and Crystallization is the physical process of hardening during the formation and growth of crystals. During this process, heat of crystallization

is released.
- **Benefits:** Ensures product consistency, optimizes processing, and aids new material development.

Composites and Advanced Materials:

- **Applications:** Assessing thermal behavior of composites and ceramics.
- **Benefits:** Ensures reliability under various conditions, aiding in high-performance material development.

Pharmaceuticals:

- **Applications:** Characterizing Thermal Stability. A material is thermally stable if it does not decompose under the influence of temperature. One way to determine the thermal stability of a substance is to use a TGA (thermogravimetric analyzer).
- **Benefits:** Enhances drug formulation stability, compliance, and effective drug delivery.

Food and Beverages:

- **Applications:** Analyzing melting behavior of fats and oils.
- **Benefits:** Improves texture, stability, and shelf life.

Chemicals:

- **Applications:** Studying reaction kinetics, Curing (Crosslinking Reactions). Literally translated, the term â€œcrosslinkingâ€œ means â€œcross networkingâ€•. In the chemical context, it is used for reactions in which molecules are linked together by introducing covalent bonds and forming three-dimensional networks. curing processes, and Thermal Stability. A material is thermally stable if it does not decompose under the influence of temperature. One way to determine the thermal stability of a substance is to use a TGA (thermogravimetric analyzer).
- **Benefits:** Optimizes manufacturing, improves safety, and enhances performance.

Electronics:

- **Applications:** Evaluating thermal properties of electronic materials, like batteries.
- **Benefits:** Enhances thermal management, ensuring device longevity and reliability.

Common Testing Standards for ASTM

- D3418 â€“ Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry.
- D3895 â€“ Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
- D4419 â€“ Standard Test Method for Measurement of Transition Temperatures of Petroleum Waxes by Differential Scanning Calorimetry.
- D4591 â€“ Standard Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry.
- D5028 â€“ Standard Test Method for Curing Properties of Pultrusion Resins by Thermal Analysis.
- E793 â€“ Standard Test Method for Enthalpies of Fusion and Crystallization by Differential Scanning Calorimetry.
- E794 â€“ Standard Test Method for Melting and Crystallization Temperatures By Thermal Analysis.
- E1269 â€“ Standard Test Method for Determining Specific Heat Capacity by Differential Scanning Calorimetry.
- E1356 â€“ Standard Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry.
- E1782 â€“ Standard Test Method for Determining Vapor Pressure by Thermal Analysis.
- E2160 â€“ Standard Test Method for Heat of Reaction of Thermally Reactive Materials by DSC.
- E2716 â€“ Standard Test Method for Determining Specific Heat Capacity by Sinusoidal Modulated Temperature Differential Scanning Calorimetry.

Specification

According to **ASTM D3895, ISO11357, EN728, ASTM D3418, ISO 11357, ASTM E967, ASTM E968, ASTM E793, ASTM D3895, ASTM D3417, ASTM D3418, DIN 51004, DIN 51007 and DIN 53765.**

Up to 500C

Including standard Tin, Ind pellets for calibration checkout

100 pcs of aluminum pans

Software CD (windows based software including Report out to WORD)

N2 and O2 rotameter mass flow controller

Hoses and connectors

Software also has data export to advantage Software for analysis

DSC measuring cell according to the heat flux principle

Temperature sensors for control & sample temperature

Connection for Purge gas flow to the sample for 2 gas types

Temperature accuracy 0.1 C

Sensitivity: 3.6 to 4.0 Î¼V/mW

Sensor Time constant: 2.5 s

Calorimeter accuracy of Â± 2%

Calorimetric precision of Â± 0.5% or better

Two connections for purge gas-Inlet to the sample & 1 connection for cooling air