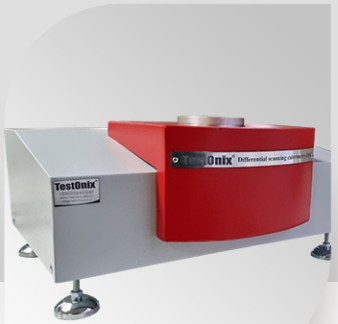
TestOnix®

Innovative & Smart Testing



Differential Scanning Calorimetry

DSC

Working with Differential Scanning Calorimetry (DSC) involves more than merely operating the equipment; it also requires sample preparation, data analysis, and interpretation of the resulting curves. The DSC is central to this process, providing essential tools for comprehensive polymer

contact us

info@Testonix.com.tr - +90 530 842 19 47

TestOnix®

Innovative & Smart Testing

Important Standards for Polymer Testing

There are several relevant standards existing for application, evaluation and interpretation of DSC data in the polymer field. The DSC operates based on all of them. A selection of standards can be found in the following table.

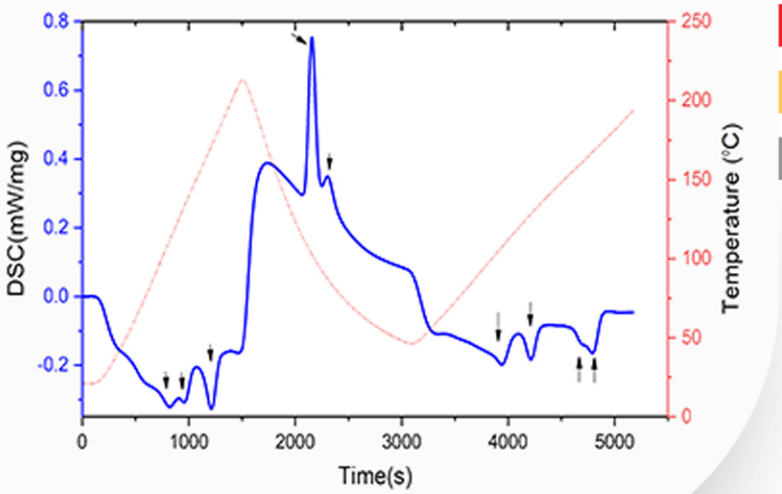
Standard	Description
General	
ISO 11357 , Part 1 to 7	Plastics-Differential Scanning Calorimetry (DSC)
ASTM D3417	Heats of Fusion & Crystallization of Polymers Thermal Analysis
ASTM D3418	Transition Temperatures & Enthalpy of Fusion & Crystallization by DSC
ASTM D4591	Temperatures & Heats of Transitions of Fluoropolymers by DSC
ASTM E793	Heats of Fusion & Crystallization by DSC
ASTM E794	Meliting & Crystallization Temperatures by Thermal Analysis
ASTM E1356	Glass Transition Temperatures by DSC
ASTM F2625	Enthalpy of Fusion, Percent Crystallinity, & Melting Point of Ultra-High Molecular Weight Polythylene by DSC
Oxidative Stability (OIT)	
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials - Oxidative-Induction Time
ASTM D3895	Polyolefins by DSC - Oxidative-induction Time

DSC Specification

TestOnix®

- Based on heat-flux system
- 2-Point temperature calibration
- DSC factor calibration
- Baseline treatment
- Capability of programming for heating , cooling & maintaining test temperature constant
- Capability of cycling test
- measuring heat-flow rate with a resolution of ±0.5µw
- Equipped with min-max gas flow alarm
- Heating rate: 0.1-40 °C/min
- Capable of saving database
- Capable of measuring:
  - DSC - OIT
  - Melt enthalpy
  - Melt point,
  - Glass transition temperature & crystallization

TestOnix®



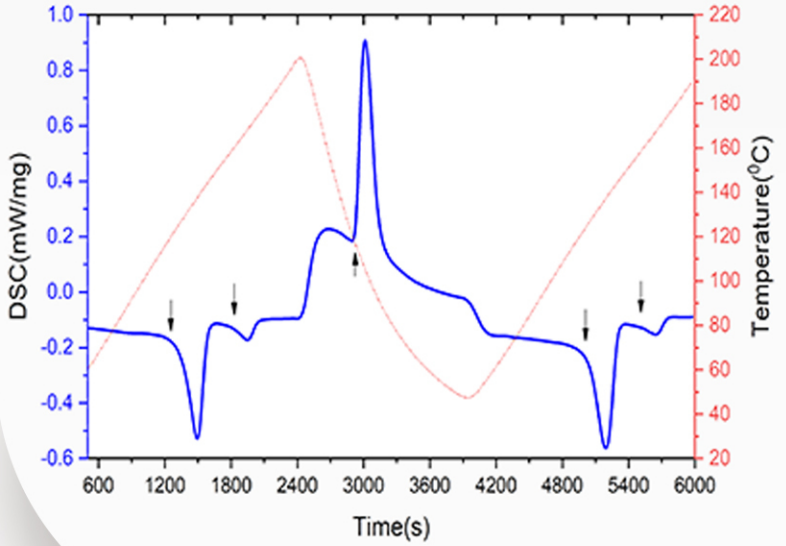
Compund industry

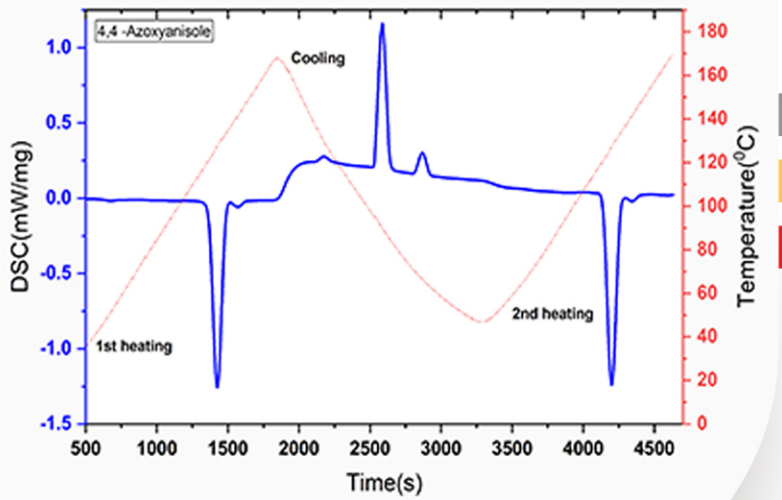
DSC is able to detect exothermic or endothermic processes associated with thermal decomposition or chemical reactions. The temperature and nature of these events can help pinpoint the compound. Every compound has an individual melting point. Known melting point reference data can be used to identify the compound by comparing the melting point of an unknown sample. Here we performed an experiment on a polymeric substance. The results clearly show that this material has two-grade polyethylene (HDPE-LDPE) as well as Polypropylene.

HDPE recyclate

In another example, a sample of HDPE was contaminated with some polypropylene during regrind for recycling purposes. The DSC results on the contaminated HDPE are shown in Figure

You can estimate the polypropylene contaminant level in the sample of HDPE recyclate based on the relative heats of melting of the polypropylene and HDPE components in this sample. Our DSC gives you sufficient resolution and sensitivity to successfully detect the two components.



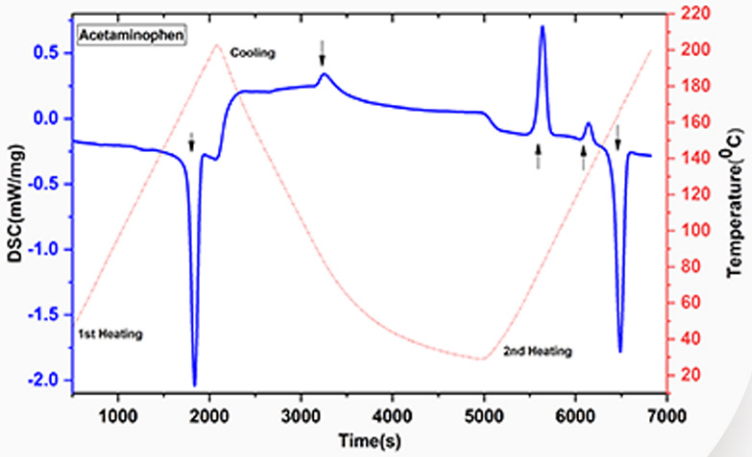


Azoxyanisole Test

According to TAWN (Netherlands Thermal Analysis Group), a common test substance for DSC resolution and sensitivity is Azoxyanisole. Azoxyanisole is an organic material with two closely spaced transitions, the primary melting transition and a small liquid-crystalline transition. Resolution of the DSC, is the ability of the DSC to resolve the two events.

info@Testonix.com.tr - +90 530 842 19 47

TestOnix®



Pharmacy industry

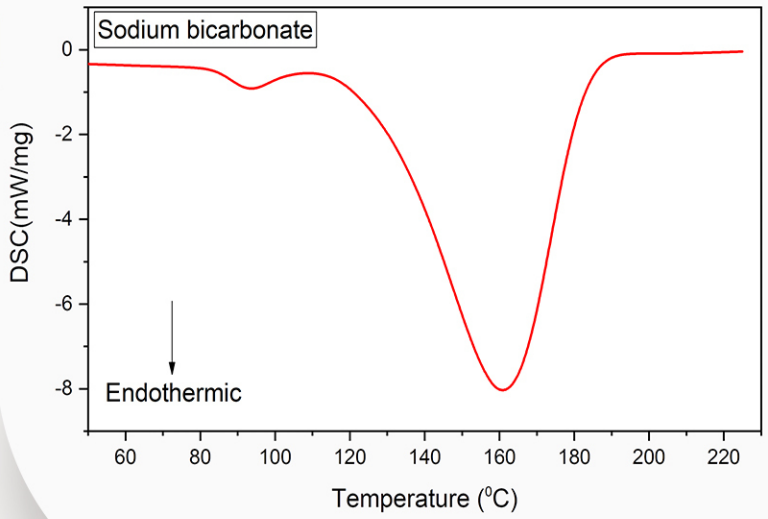
Different polymorphs also have different rates of dissolution when ingested, so it is important to characterize these polymorphic properties of pharmaceutical materials. Our DSC delivers the sensitivity and resolution levels which are mandatory from the demanding applications across the pharmaceutical R&D spectrum. Results of DSC done on a tablet of acetaminophen is shown here. It is clearly evident that the DSC device is capable of providing excellent resolution to clearly detect the crystallization exotherms of the polymorphs present in the second heat.

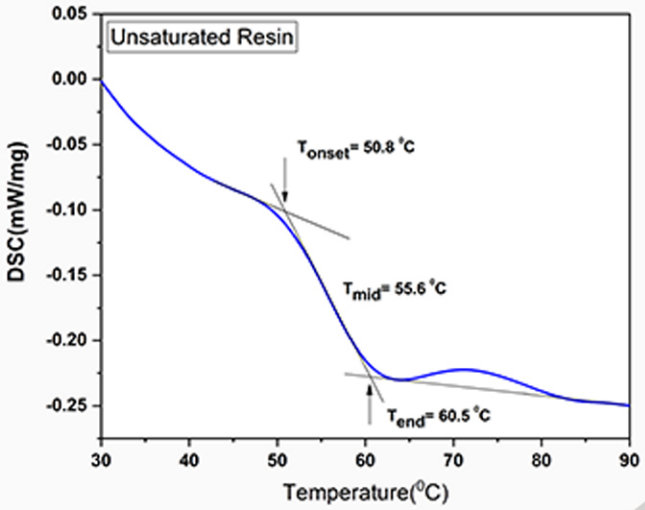
Food industry

DSC is a valuable tool for detecting and analyzing sodium bicarbonate in the food industry. Its ability to provide precise thermal data ensures the quality, performance, and safety of food products containing this important additive. By monitoring the thermal behavior of sodium bicarbonate, food manufacturers can optimize formulations, comply with regulations, and deliver consistent, high-quality products to consumers.

Sodium bicarbonate undergoes a characteristic endothermic decomposition reaction when heated, which can be detected by DSC. This decomposition is an endothermic process, meaning it absorbs heat, which is detected as a peak in the DSC thermogram.

The decomposition of sodium bicarbonate typically appears as a broad endothermic peak in the temperature range of 50°C to 200°C.





Resin Test

DSC is also widely used in material science to characterize thermal properties of materials, such as the glass transition of resins. The glass transition temperature (Tg) describes a fundamental material property, which will be most relevant to polymer resins and composites. It indicates the temperature upon which the material transitions from a brittle, glassy state to a more soft, rubbery state.

Let us look at how DSC is employed to characterize resins and determine Tg:

1-A small piece of resin (e.g. a few mg) is put into the DSC and heated up at a fixed temperature rate (e.g. 10°C/min). 2-Heat flow into the sample is measured as the temperature increases. 3-Tg- A step change at the heat flow curve is observed at Tg, due to change in the heat capacity of the material.

The midpoint of this step change in temperature is more generally referred to as the Tg.

info@Testonix.com.tr - +90 530 842 19 47

Innovative & Smart Testing

info@Testonix.com.tr - +90 530 842 19 47

Testonix®