How to Create Amorphous PET in a DSC – The Importance of Fast Cooling Rates

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Introduction

PET is a semi-crystalline thermoplastic polymer. The amorphous phase can recrystallize during heating: The polymer chains of the amorphous phase start to move as soon as a temperature above the glass transition temperature is reached, and they can then reorganize themselves in a crystalline structure. This so-called post-crystallization depends on the proportion of the amorphous phase in the polymer and can be investigated by means of DSC.

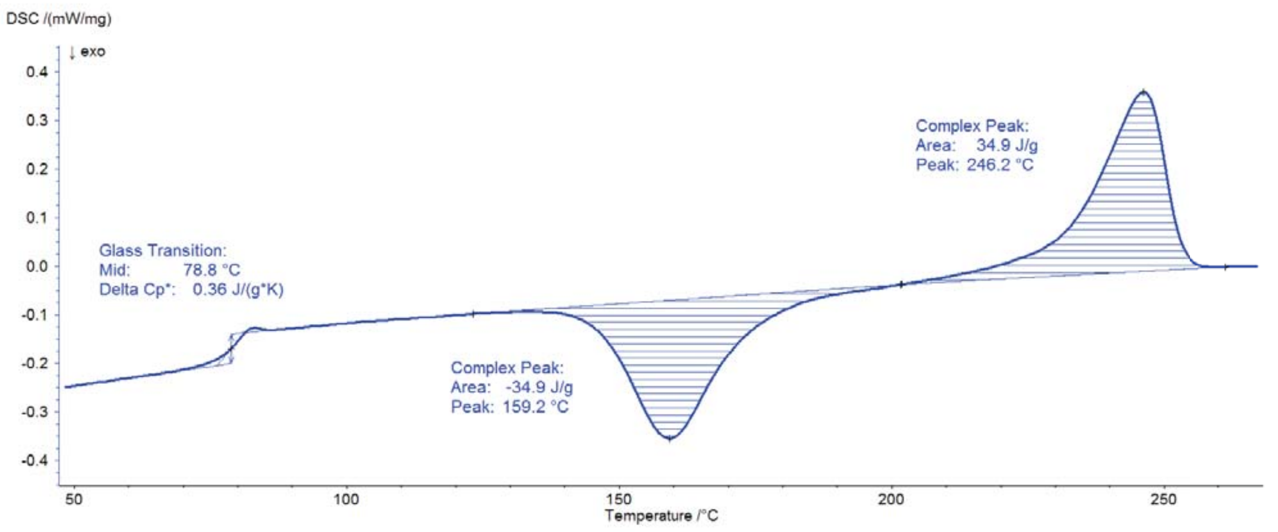
Test Conditions

A small 2.86-mg piece of a commercial plastic water bottle was measured in a *Concavus* pan. The NETZSCH DSC 214 *Polyma* was used to heat the sample to 300°C and cool it at 200 K/min. After that, the polymer was heated to 300°C again, at 10 K/min.

Test Results

This second heating is depicted in figure 1. The endothermic step detected at 78.8°C (mid-point) can be attributed to the glass transition of PET. The two peaks found between 130°C and 260°C result from post-crystallization and melting of the polymer, respectively. The two peak areas are identical (35 J/g).

This shows that the PET sample was completely amorphous following the fast cooling. Part of the amorphous content crystallizes during heating and ultimately melts completely at higher temperatures.



1 Heating of a PET sample after cooling at 200 K/min

NGB · Application Sheet 257· E · 12/13 · Technical specifications are subject to change.

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