APPLICATION**SHEET**

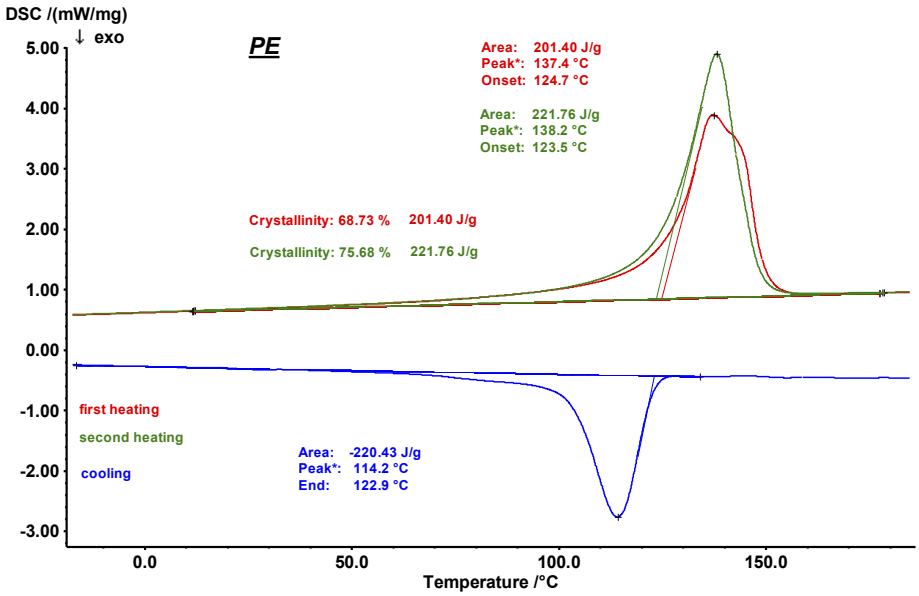
Polymer – Polymer Manufacturing

DSC 204 ***F1*** *Phoenix*®

PE – Determination of the Degree of Crystallinity

Introduction

Polyethylene is a thermoplastic commodity heavily used in consumer products (over 60M tons are produced worldwide every year). Polyethylene is created through polymerization of ethene. It can be produced through radical polymerization, anionic polymerization, ion coordination polymerization or cationic polymerization. This is because ethene does not have any substituent groups which influence the stability of the propagation head of the polymer. Each of these methods results in a different type of polyethylene.



Test Conditions

Temperature range:	-50°C ... 200°C
Heating/cooling rates:	10 K/min
Atmosphere:	Nitrogen
Sample mass:	12.38 mg
Crucible:	Aluminum, pierced lid
Purge gas flow:	40 ml/min

Test Results

During the heating segments of DSC measurements, the melting behavior (according to the crystalline content of the polymers) can be analyzed. The peak area represents the enthalpy change which is necessary to melt the crystalline amount. During cooling, crystallization is detected if the cooling rate is slow enough. Crystallization can be suppressed with an increasing cooling rate and therefore, an increasing amount of the polymer remains amorphous. The degree of crystallinity of the investigated PE sample can be calculated by evaluation of the melting enthalpy of the first heating (201.4 J/g) and comparison with the literature value for 100% crystalline PE (293 J/g). DSC measurement conditions (cooling at 20 K/min) obviously increase the degree of crystallinity what is indicated by a higher melting enthalpy for the second heating (221.7 J/g).

NGB · Application Sheet 119 · E · 2020 · Technical specifications are subject to change.

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