

# APPLICATION SHEET

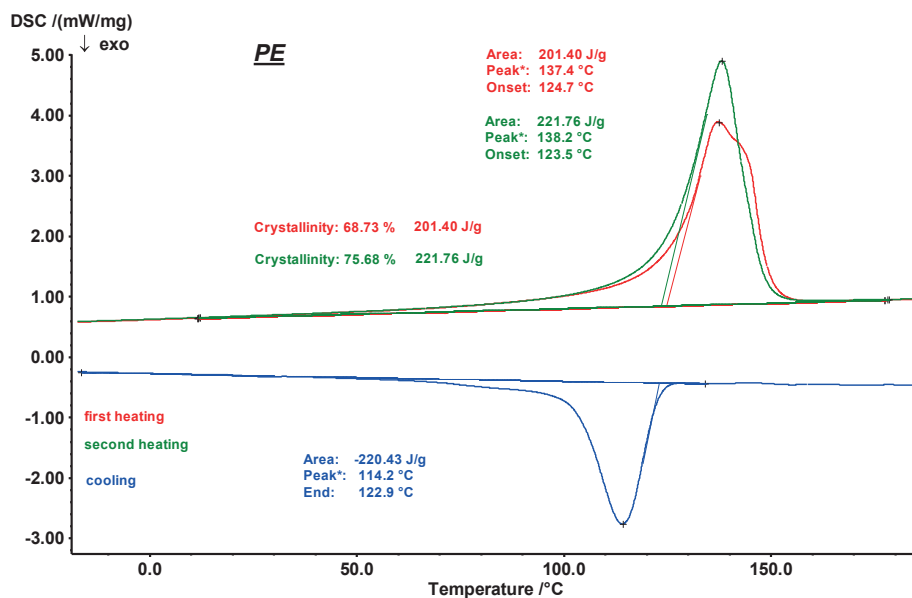
Polymer · Polymer Manufacturing  
DSC 204 F1 Phoenix®

## 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 by 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 at 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).