

# APPLICATION SHEET

Polymer – Polymer Manufacturing

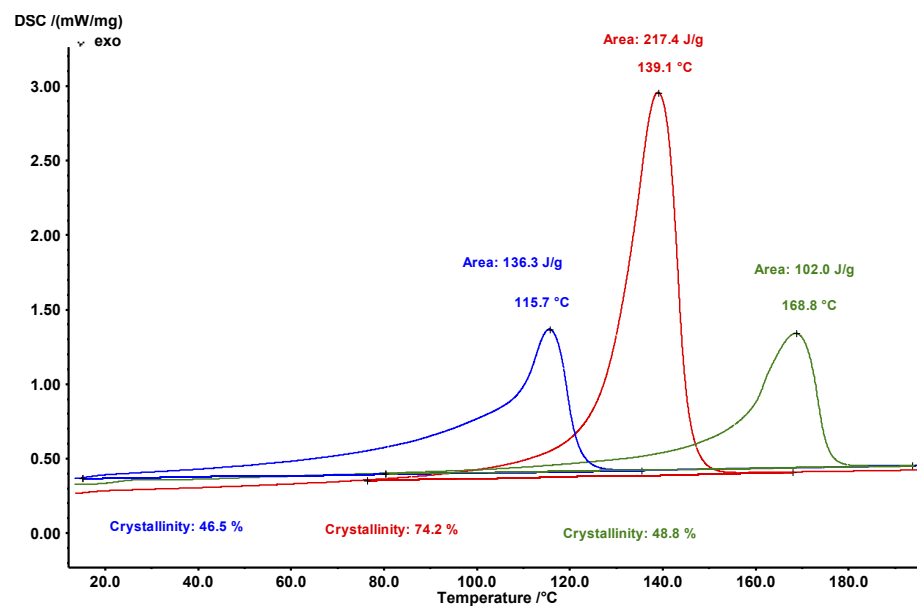
DSC 204 **F1 Phoenix**®

## Determination of the Degree of Crystallinity of Polymers (PE and PP)

### 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. LDPE is defined by a density range of 0.910-0.940 g/cm<sup>3</sup>. HDPE is defined by a density of greater or equal to 0.941 g/cm<sup>3</sup>. Polypropylene or polypropene (PP) is a thermoplastic polymer, used in a wide variety of applications, including food packaging, textiles, laboratory equipment, loudspeakers, automotive components, and polymer banknotes.



### Test Conditions

Temperature range: RT ... 200°C  
Heating/cooling rates: 10 K/min  
Atmosphere: Nitrogen at 40 ml/min  
Sample mass: 12.0 ± 1 mg  
Crucible: Aluminum, pierced lid  
Purge gas flow: 40 ml/min

### Test Results

The melting behavior of low-density polyethylene (LDPE), high-density polyethylene (HDPE) and polypropylene (PP) is depicted in the figure. Peak temperatures help identify polymers and polymer mixtures. The peak areas represent the melting enthalpies. From these experimental values, the degree of crystallinity can be determined with the standard *Proteus*® evaluation software. The melting enthalpy for 100% crystalline PE is 293 J/g and for PP 207 J/g. These values are included in a table for the most common thermoplastic materials.