

# APPLICATION SHEET

## Polypropylene – DSC 214 Polyma

### Increase in the Crystallinity of Polypropylene by Tempering

Claire Strasser

#### Introduction

The thermal history of polymers – e.g., how fast they were cooled or their storage temperature – has a high influence on their mechanical properties. Here, the influence of tempering on the crystallinity of polypropylene was investigated.

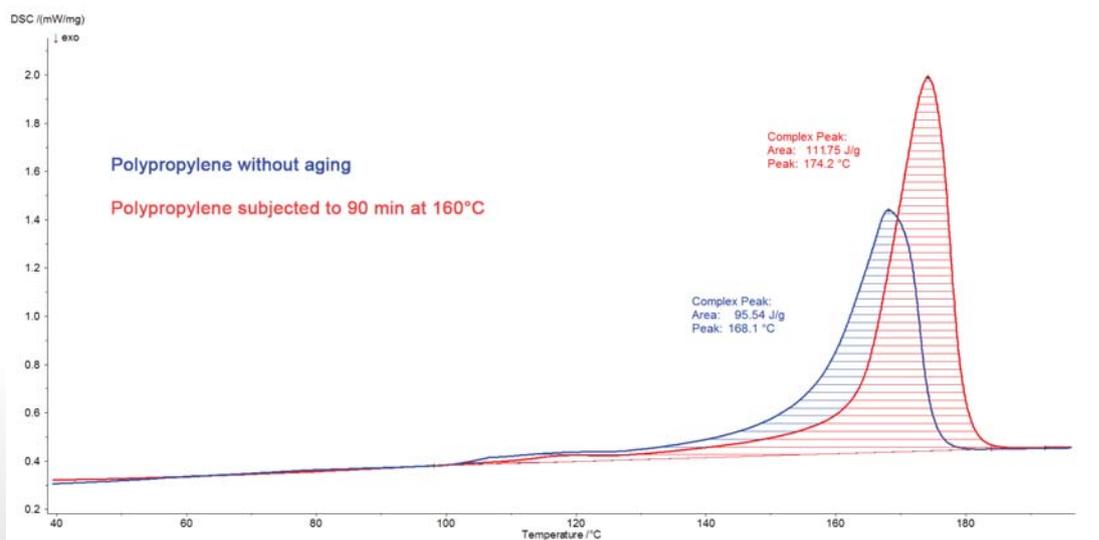
#### Test Conditions

A polypropylene sample was put in a drying oven for 90 minutes at 160°C to simulate thermal aging. Subsequently, 11.00 mg was weighed and heated twice to 200°C at 10 K/min with the DSC 214 Polyma. Between the two heating runs, the sample underwent controlled cooling at 10 K/min. The same polymer, but without tempering, was

also measured under exactly the same conditions. For this second test, a sample of 10.67 mg was prepared.

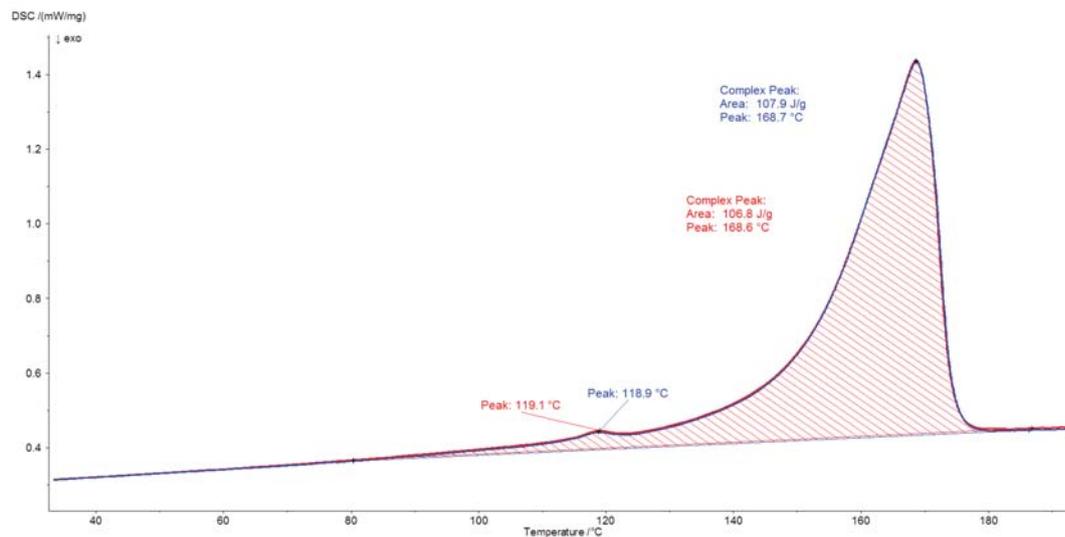
#### Test Results

The comparison of the 1<sup>st</sup> heating runs is shown in figure 1. The polypropylene without tempering melts at 168.1°C (peak temperature) with an enthalpy of 95.5 J/g. The melting peak of the aged polypropylene is shifted to higher temperatures (peak temperature at 174.2°C). The melting enthalpy of 111.75 J/g is also higher, which can be attributed to a higher degree of crystallinity in the polymer. During tempering at 160°C, part of the polymer chains rearranged to form a new crystalline structure with bigger crystallites resulting in a higher degree of crystallinity.



1 Comparison of the 1<sup>st</sup> heating of polypropylene with and without aging

## APPLICATION NOTE Increase in the Crystallinity of Polypropylene by Tempering



2 Comparison of the 2<sup>nd</sup> heating of polypropylene with and without aging

The 2<sup>nd</sup> heating of the two samples is depicted in figure 2. The polypropylene samples, separately prepared but now with the exact same thermal history (cooling at 10 K/min), yield nearly identical curves. This demonstrates the excel-

lent reproducibility of the DSC 214 *Polyma*. The additional peak at 119°C (+/- 0.1°C) most probably results from a small amount of polyethylene present in the sample.