Melting of different polymers by DSC

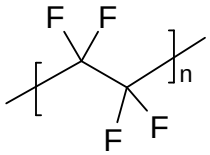
Introduction

When the polymer's melting temperature is reached, the crystals begin to fall apart. The chains come out of their ordered arrangements, and begin to move around freely. So the knowledge of the melting point of a polymer is one of the basic information for its use. This temperature depends most of all on the type of polymer but also on its crystal forms, including plasticizers or other additives. The melting point of a polymer is easily determined by DSC and measured at the top of the endothermic peak. The dedicated ISO11357-3 standard describes such a melting determination. In this note are given the melting curve of different types of polymers.

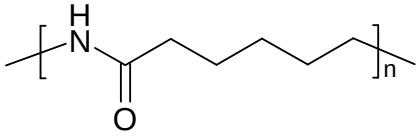
Experimental

Samples:

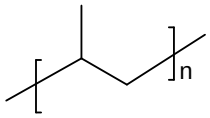
- PolyTetraFluoroEthylene (PTFE)



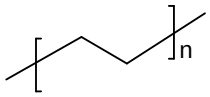
- Polycaprolactam (Nylon 6)



- PolyPropylene (PP)



- PolyEthylene Linear Low Density (PE-LLD)
- PolyEthylene medium density (PE MD)



DSC 131 Evo experimental conditions:

Atmosphere: Nitrogen, atmospheric pressure

Sample mass: about 25 mg in a 100µl aluminum crucible

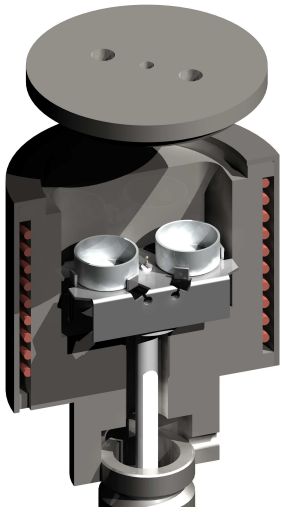
Experimental procedure:

The temperature is programmed from room temperature until the end of melting at 10°C/min.

Instrument

DSC 131 Evo

-170 up to 700°C



DSC 131 Evo Sensor with aluminum crucibles

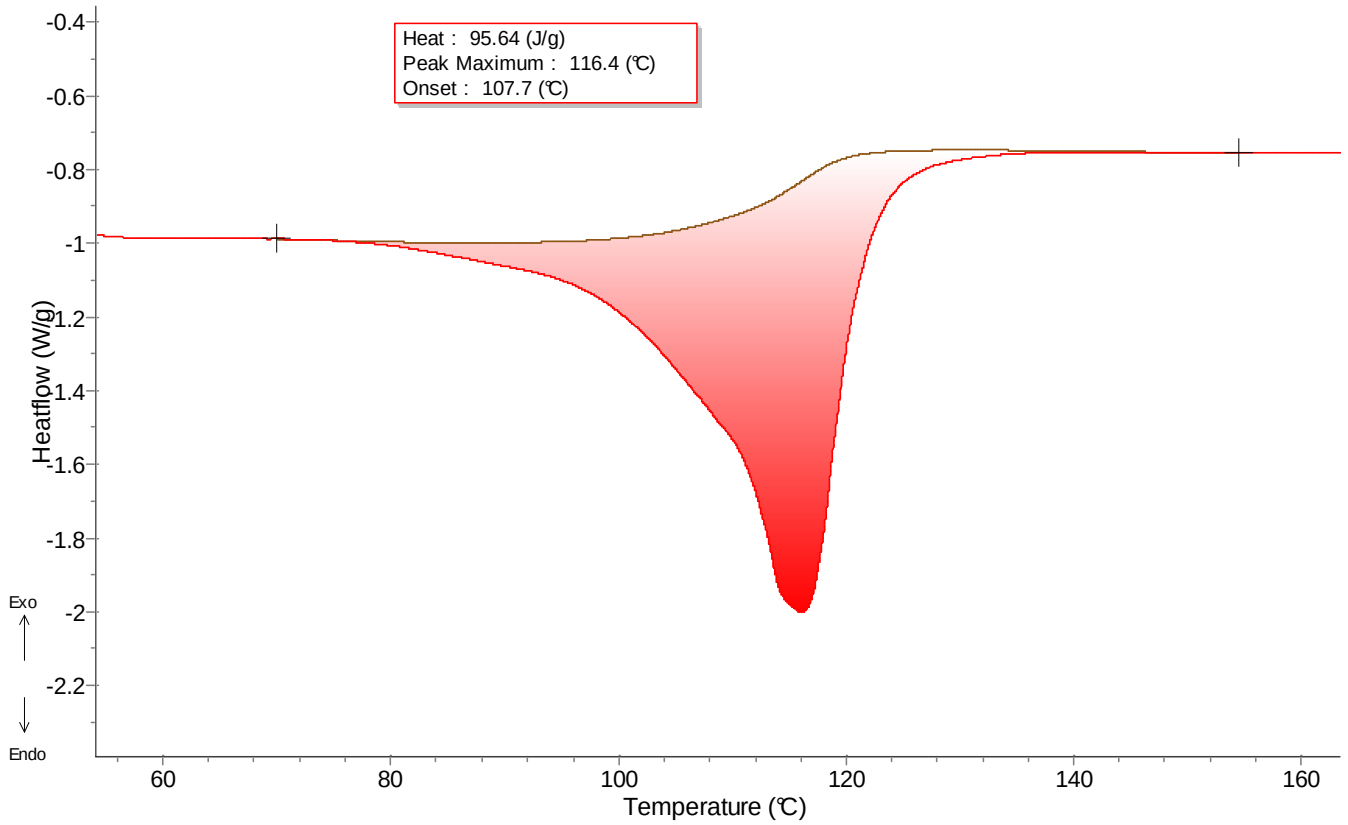


Figure 1: Melting of Polyethylene Medium Density

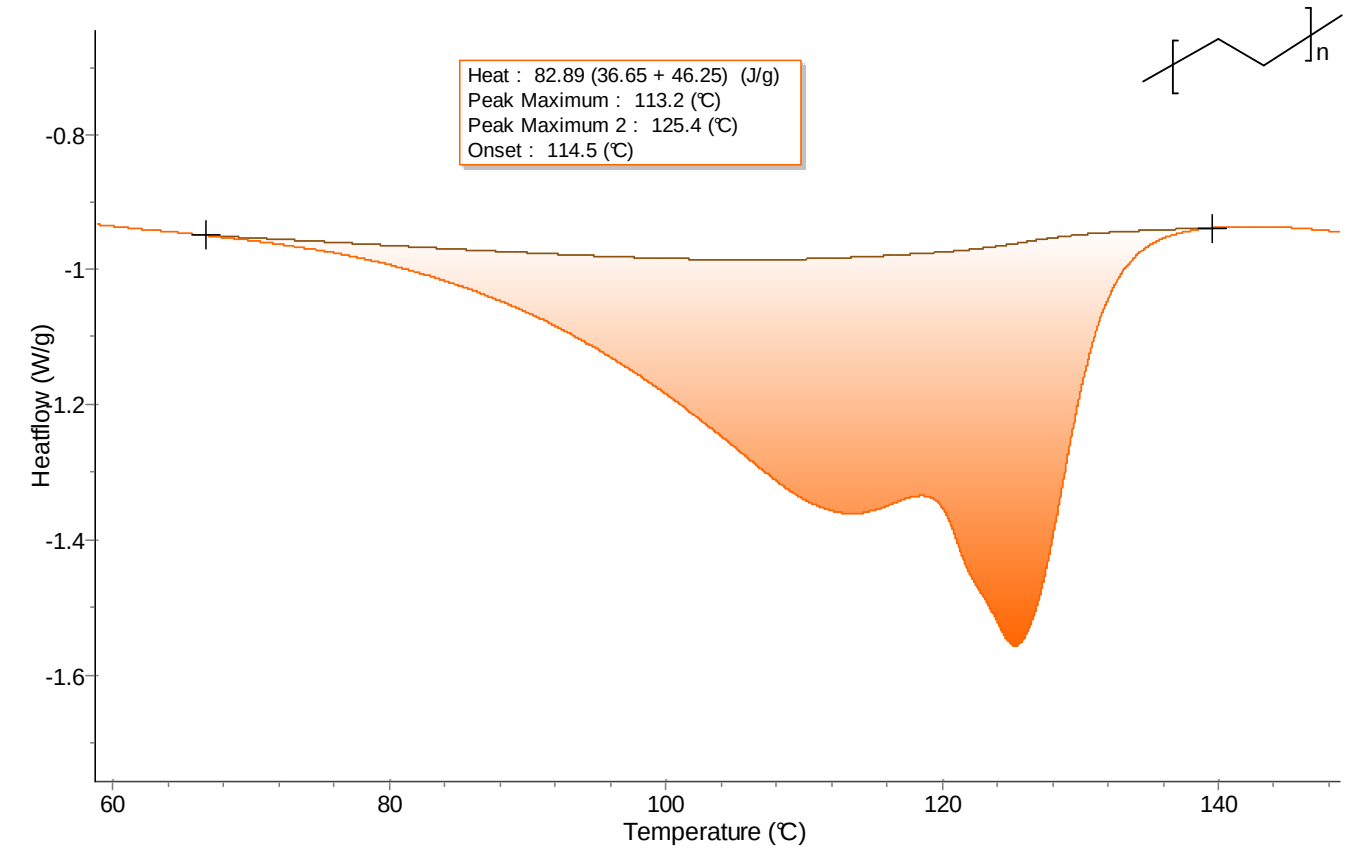


Figure 2: Melting of Linear Low Density Polyethylene

In the case of PE-LLD, the melting phenomenon presents two steps. This is coming from a copolymer composed of different types of olefins which provide its particular properties. The two maxima are due to the different components of the copolymer.

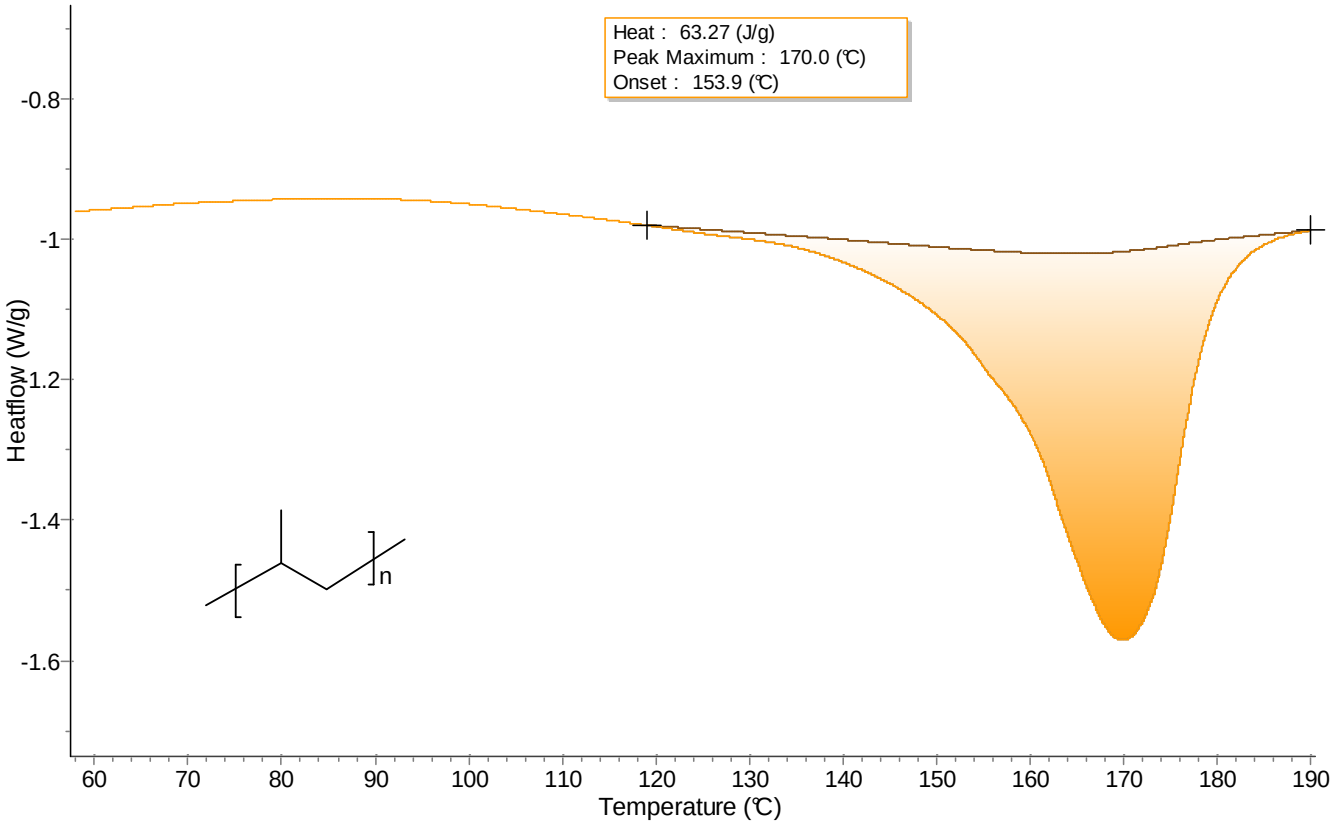


Figure 3: Melting of Polypropylene

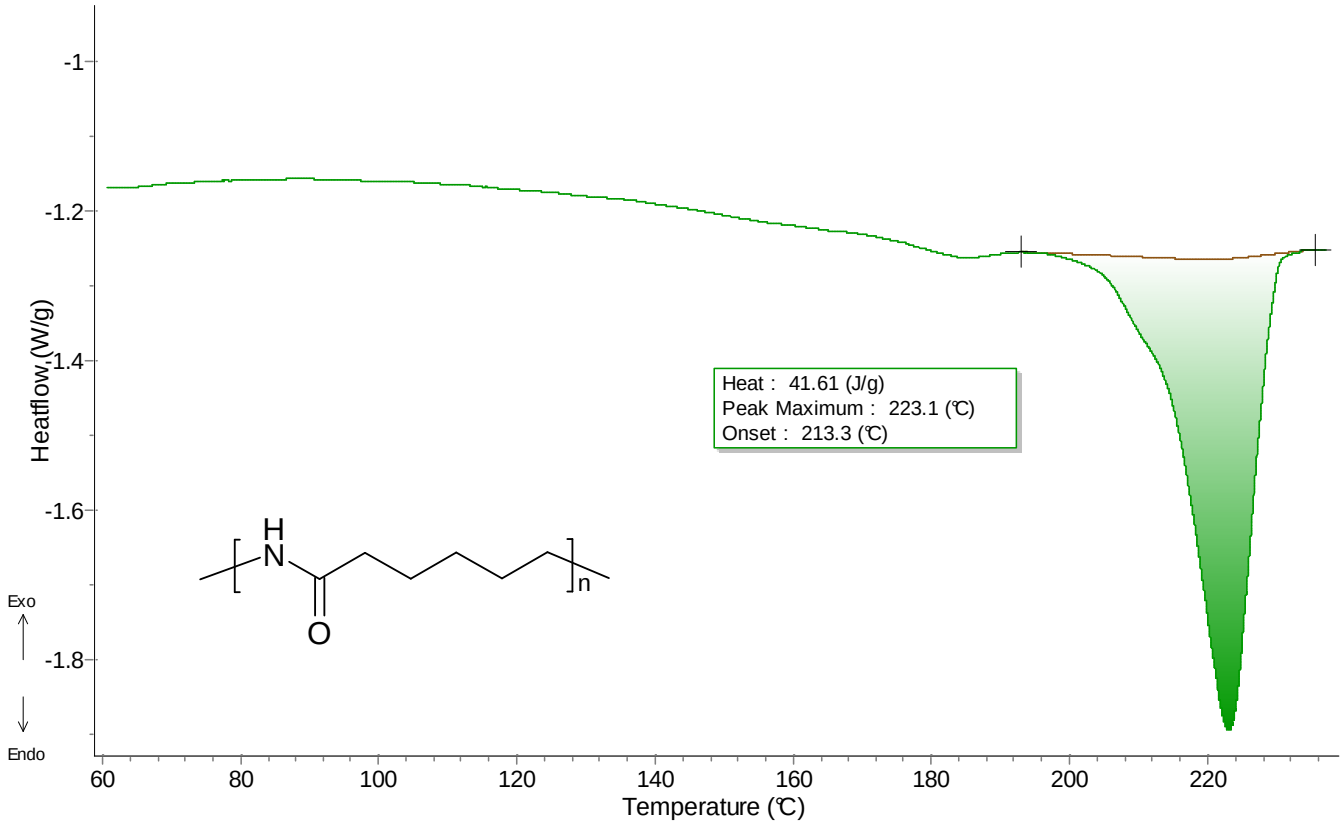


Figure 4: Melting of Nylon 6

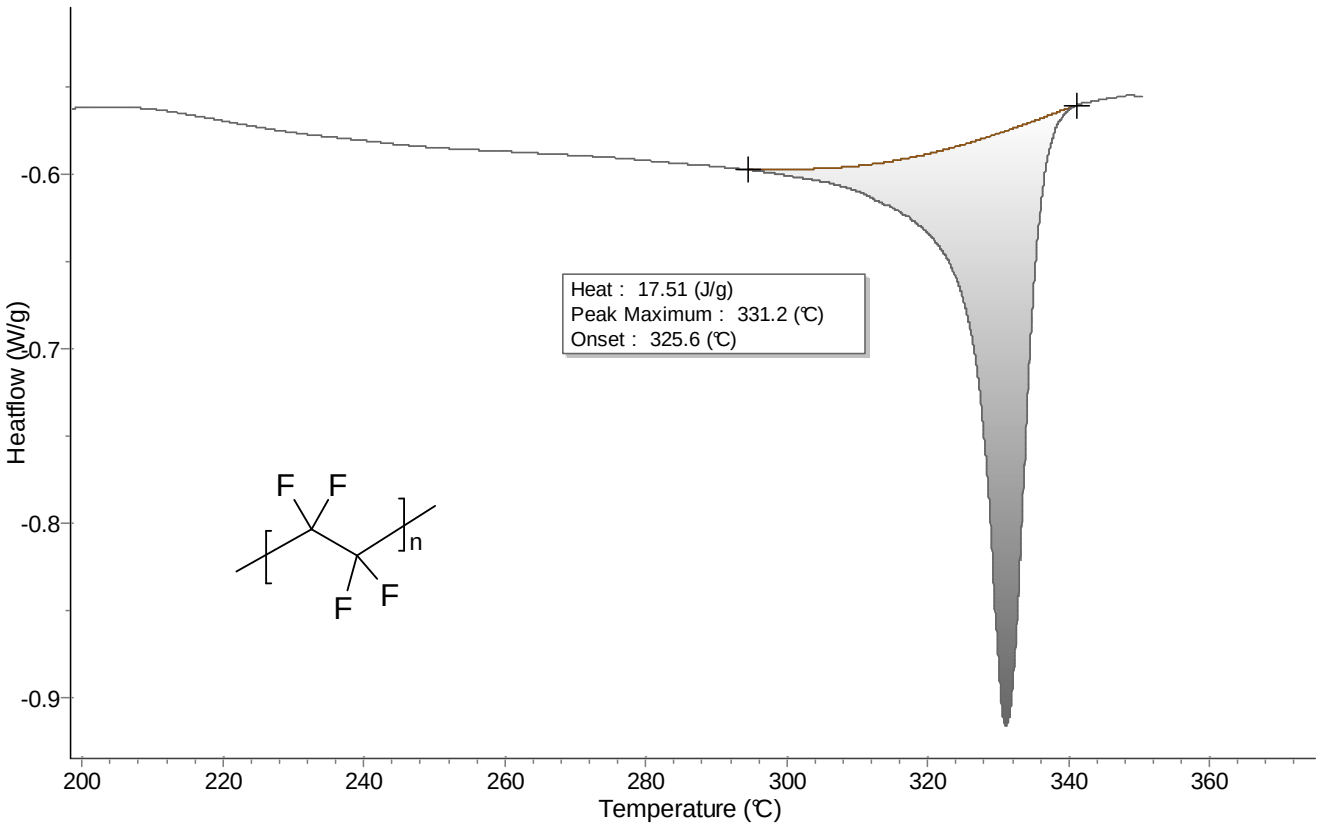


Figure 5: Melting of Polytetrafluoroethylene

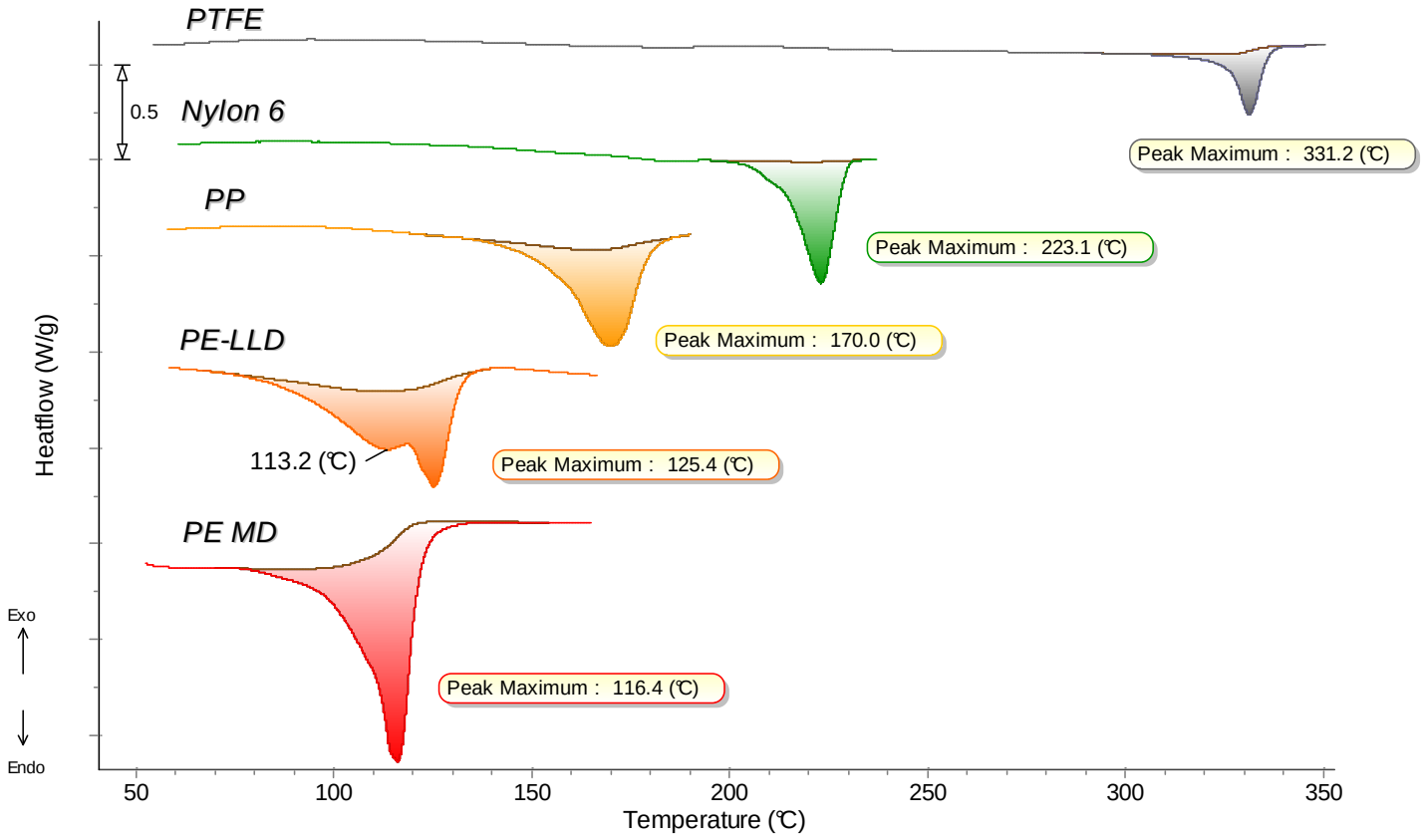


Figure 6: Superposition of the different melting peaks of each studied polymer