

Measurement of Fusion Process of Nylon 66

Influence of Heat Treatment (Cooling Rate)

It is known that thermal and mechanical characteristics of high polymer materials largely depend on their thermal history. Accordingly, consideration must be taken on the relation between physical property and heat treatment (thermal history) of the materials subjected for evaluation. In the case of some thermosetting substances like polyester and nylon, for instance, fusion peaks of different shape may be observed if they are cooled at a different rate and heated again with DSC, as their crystal structure has changed differently depending upon the cooling rate after fusion.

The following is the result of measurements of specimens of nylon-66 crystallized at different cooling rates including a high speed cooling rate of as fast as 300° C/min. Fusion peaks were obtained for comparison purpose among specimens of nylon-66 crystallized at different cooling rates of 5° C/min., 50° C/min., and a high speed, and heated again at a common rate of 10° C/min.

Result of measurements

Fig.1 shows a fusion peak of an original sample (14.3mg) heated at a rate of 10° C/min, and Fig.2 is a DSC curve in a cooling process at a rate of 5° C/min.

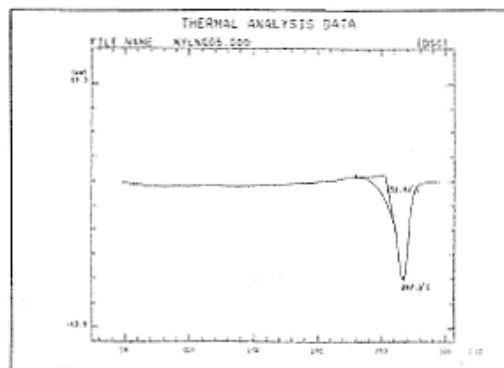


Fig.1 Fusion peak of Original Sample

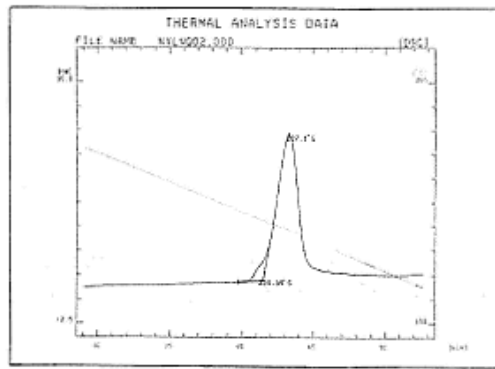


Fig.2 DSC Curve in Cooling Process

Figs.3-5 show DSC curves of specimens (14.3mg) cooled at a rate of 5° C/min., 50° C/min., and high speed for each, and reheated. An endothermic peak is observed at around 260° C. Attention is given to specimens cooled at rapid rates (50° C/min. and high speed), both of which have an exothermic peak immediately before fusion. These peaks are considered as a result of crystallization.

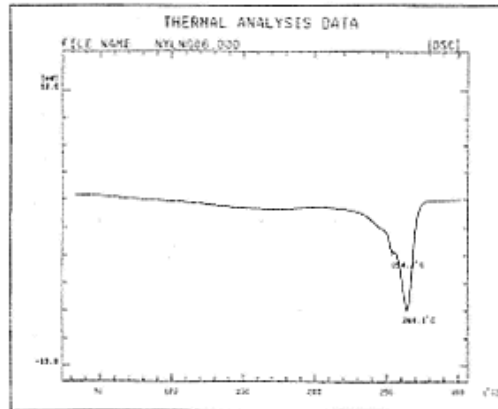


Fig.3 Fusion of Specimen Cooled at 5°C/min

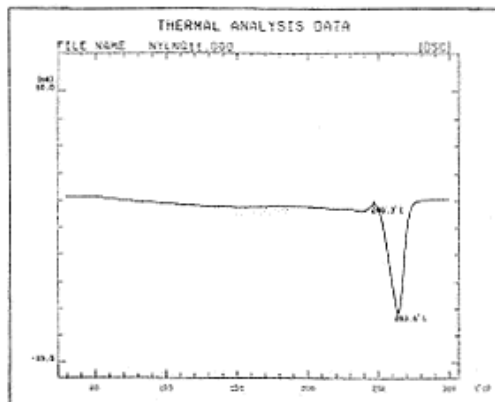


Fig.4 Fusion of Specimen Cooled at 50°C/min

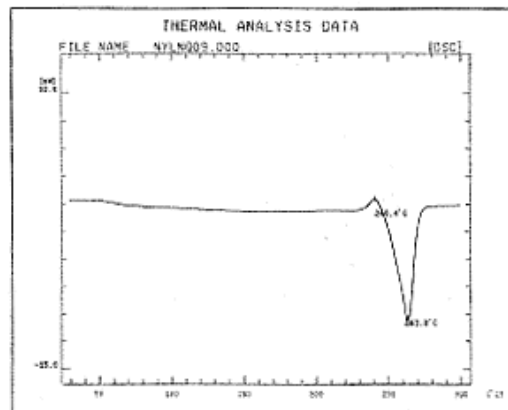


Fig.5 Fusion of Specimen Cooled at High Speed

Fig.6 shows the four curves in overlapping presentation of the peak shape difference depending on the difference of heat treatment (cooling rate).

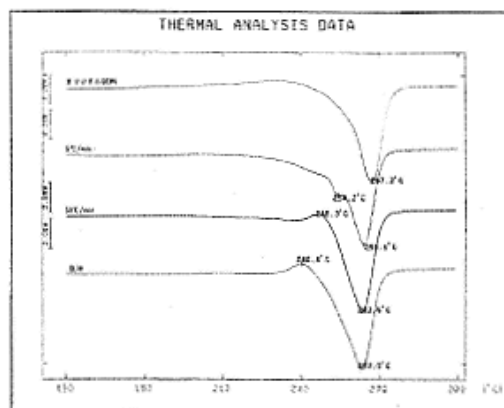


Fig.6 Comparison Among Specimens

* Please be advised that data obtained before the implementation of the current Weights and Measures Law may be presented in terms of gravimetric unit.



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