Application Brief

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Penetration Measurement of Polymer Film by TMA

1. Introduction

The softening temperature of polymer films is one of important point to evaluate the property of the film. This softening temperature can be measured by TMA penetration method. In this method, the penetration probe which has small cross section on the pointed end is loaded on the film sample in the furnace and it is heated. When the sample starts softening, the probe penetrates and goes down into the sample. This onset temperature is the softening point and the displacement is the thickness of the film.

Here is the introduction of this application measured by TMA120.

2. Measurement Data

The measurement results of polyethylene(PE), polypropylene(PP) and nylon(NY) are shown in Figure 1. Each softening temperature between the different polymers can be observed.

In Figure 2, the results of high density polyethylene(HDPE), middle density polyethylene(MDPE) and low density polyethylene(LDPE) with each 55μm thickness are shown. Each softening temperature is different depend on the density. The penetration amount is about 55μm and the thickness measurement can be done.

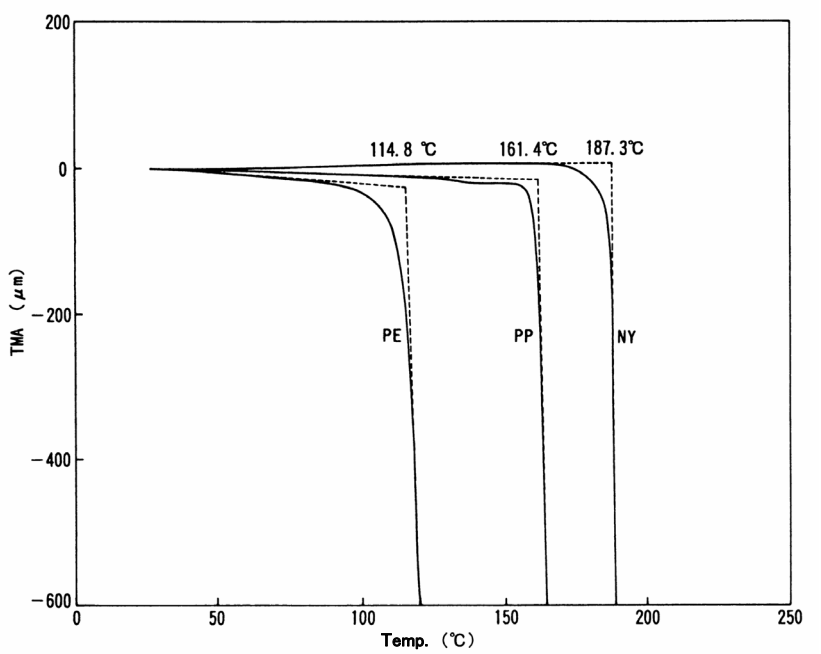

Figure 1 Penetration Measurement Data of PE, PP & NY film

In Figure 3, the penetration measurement result of two different polyethylene overlaid films is shown. The softening temperature and thickness of each layer can be measured.

On the conclusion, TMA can be the tool to measure the softening temperature and the thickness of polymer films by using penetration method.

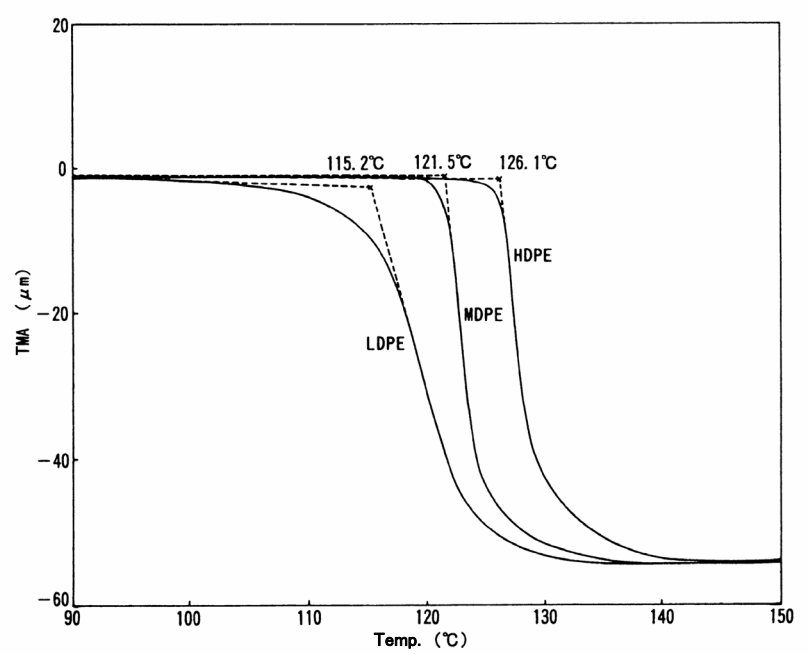

Figure 2 Penetration Measurement Data of LDPE, MDPE & HDPE film

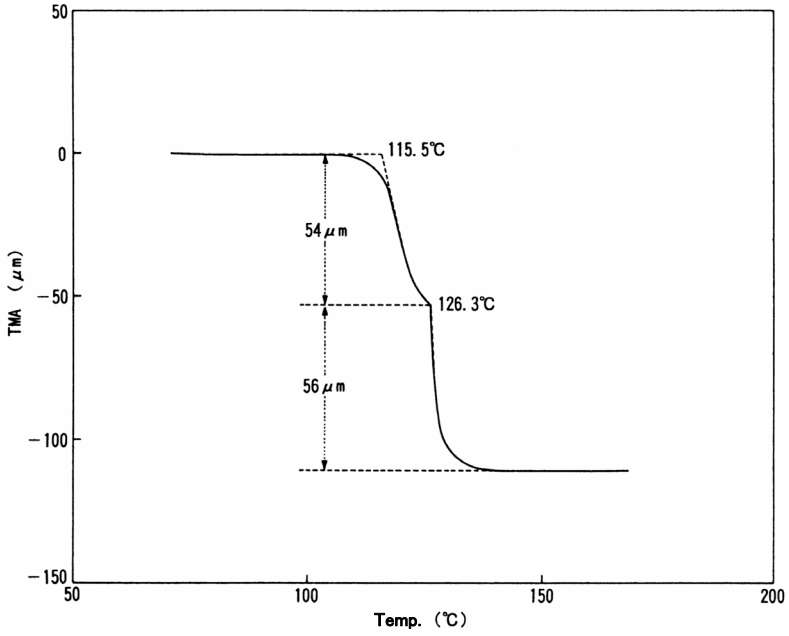

Figure 3 Penetration Measurement Data of Double layer PE film