Determination of the Dimensional Stability of Oriented PET Film

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Case Study

Bi-axially oriented Polyethylene Terephthalate (PET) film is often used in various applications for its high tensile strength, transparency, dimensional/chemical stability and barrier properties. An oriented PET film is prepared by rapid extrusion where it is quenched into its amorphous state, followed by a process of drawing to obtain biaxial orientation. Films can be prepared with different draw ratios which will impact crystallinity and subsequent thermophysical properties. Typically, the films will then be heat-set to lock in molecular orientation and crystallinity. The process results in high dimensional stability. Processors of these films are interested in quickly evaluating the dimensional stability (expansion or shrinkage) properties as well as the presence of a glass transition. The presence of a glass transition (Tg) is undesirable in the temperature range of usage because the dimensional stability usually decreases substantially at the Tg.

Solution

Furthermore, since the coefficient of expansion changes dramatically at the Tg, TMA is more sensitive for detecting the Tg. The sensitivity of TMA is particularly valuable in oriented films which usually have high crystallinity. Tg detection of high crystallinity materials may be limited by techniques such as DSC.

In this study, the results obtained indicated that the Tg values for all three films evaluated were above the highest temperature of actual end-use and that the dimensional stabilities up to the Tg were similar. Above the Tg, film C had the highest dimensional stability.

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Figure 1. Comparison of PET Thin Films

![Figure 1. Comparison of PET Thin Films](image-url)