



Figure 1. TMA Penetration of Polymer Layer on Substrate Material

Thermomechanical Analysis (TMA) measures linear or volumetric changes in sample dimension as a function of temperature, time, or force. This data provides valuable information on coefficient of thermal expansion (CTE), penetration, glass transition temperature, softening and flow, and creep/stress relaxation.

This thermal curve shows a TMA penetration experiment on a polymer film bonded to a substrate material. Using a penetration probe, the sample was scanned from room temperature up to 140  $^{\circ}\text{C}$  at 5  $^{\circ}\text{C}/\text{min}$  with a force of 0.1 N. A slight expansion of

the film is noted before sample penetration begins at 94  $^{\circ}\text{C}$ . Total penetration for this sample is measured at only 0.8  $\mu\text{m}$ . The combination of a flat baseline and excellent sensitivity allows the TMA to measure extremely small changes in sample dimension.

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