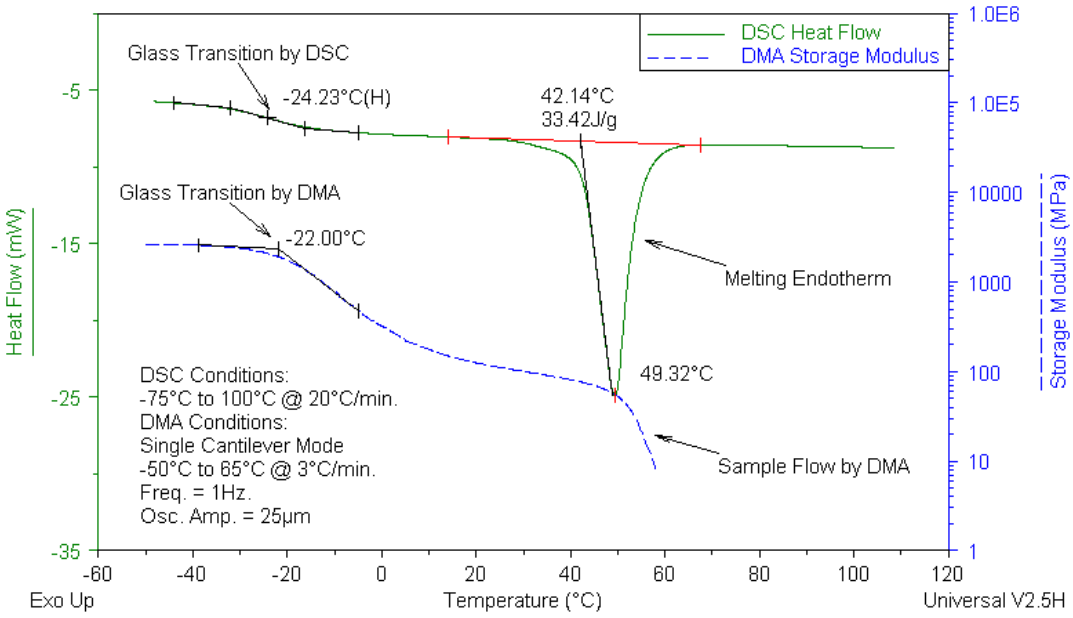
THERMAL SOLUTIONS

Characterization of a Polyurethane Hot Melt Adhesive by DSC and DMA



DSC measures the temperatures and heat flows associated with transitions in materials as a function of temperature or time in a controlled atmosphere. This technique provides quantitative and qualitative information about physical and chemical changes that involve endothermic or exothermic processes, or changes in heat capacity.

DMA measures the modulus (stiffness) and damping (energy dissipation) properties of materials as the materials are deformed under a periodic stress. These measurements provide quantitative and qualitative information about the performance of materials. DMA is particularly useful for evaluating polymeric materials that exhibit time, frequency, and temperature effects on mechanical properties because of their viscoelastic nature.

The above plot shows how DSC and DMA can be used to characterize a sample of polyurethane hot melt adhesive. DSC can be used to examine the material from a subambient starting temperature into the glass transition event and finally through the crystalline melting region. Because DMA measures the physical and mechanical changes in a material, this technique is inherently more sensitive to the glass transition temperature. Both techniques show good correlation of the Tg: -24.23°C by DSC and –22.00 °C by DMA. The storage modulus also shows the material entering the region of flow as the sample begins to melt (as seen in the DSC heat flow curve). Both DSC and DMA are valuable thermal analysis techniques that can be used to accurately characterize both thermal and mechanical properties of materials over a wide temperature range.