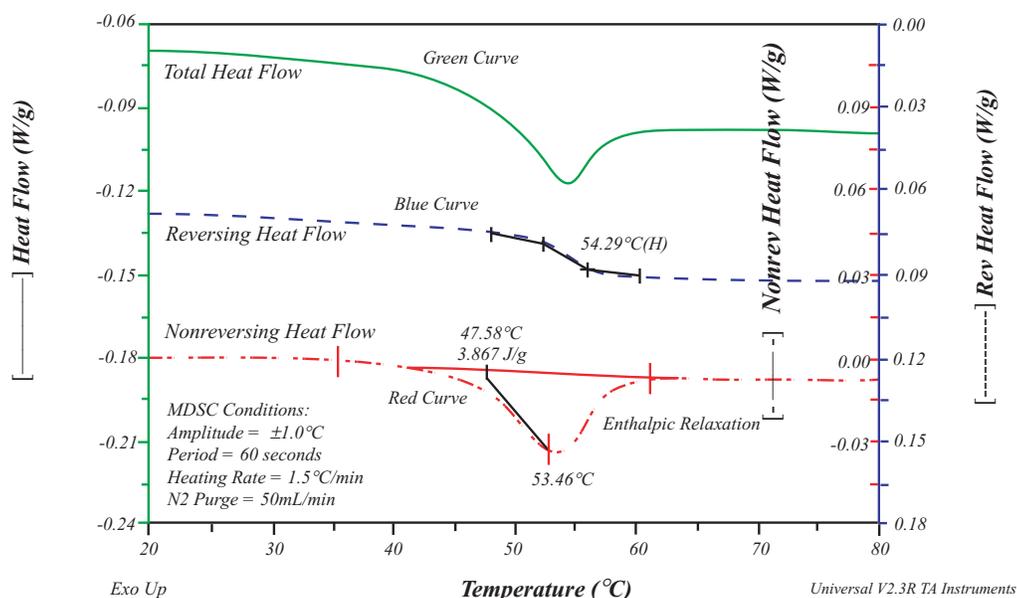


THERMAL SOLUTIONS

Characterization of a Styrene Pigment/Resin Sample By MDSC



DSC measures the temperatures and heat flows associated with transitions in materials as a function of temperature or time in a controlled atmosphere. MDSC is an enhancement to conventional DSC whereby the total heat flow is separated into reversing (heat capacity) and non-reversing (kinetic) components. The reversing signal contains heat capacity events such as the glass transition and melting. The non-reversing signal contains kinetic events such as crystallization, crystal perfection and reorganization, cure, and decomposition.

The above curve shows MDSC results on a styrene pigment/resin sample with an unknown thermal history. The customer was looking for a technique to accurately determine the glass transition temperature in a single experiment. The total heat flow signal (solid curve) shows

what appears to be a melt but is actually the glass transition with a superimposed enthalpic relaxation. The reversing heat flow signal (dashed curve) clearly shows the T_g separated from the enthalpic relaxation which is shown in the nonreversing heat flow signal. Determination of the glass transition temperature is easily accomplished by analysis of the reversing heat flow signal using ASTM E1356. Because of the overlapping thermal events, the same analysis of the total heat flow, or standard DSC heat flow signal, would be difficult. This example clearly demonstrates the advantage MDSC has over standard DSC in characterizing material properties, often in one experiment