Applications of Modulated Temperature Differential Scanning Calorimetry to Latices and Latex Based Materials

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Abstract

The recent introduction of modulated temperature differential scanning calorimetry, MTDSC, has greatly extended the power of calorimetry as a characterisation technique for polymers. Because the cyclic measure of heat capacity that this technique provides is insensitive to irreversible processes, it measures the change in heat capacity at the glass transition virtually free from interference by relaxation processes. The combination of this together with its superior signal to noise ratio and resolution means that, for the first time, it is possible to take the differential of the heat capacity and use it as a quantitative tool for characterising multiphase polymer systems. Thus, multiphase materials, interphases, miscibility, relaxation behaviour, premelting transitions etc. can now be studied in greater detail than before.

A brief introduction to the MTDSC technique and illustrations of its advantages will be provided. See references 1-4 for further details. The studies used to demonstrate the range of the technique will include detection of the glass transition in situations where resolution by conventional DSC and other techniques are difficult or impossible. The ability of the instrument readily to yield heat capacity data allows that data to be plotted as dCp/dT versus temperature which has proved to be useful in a number of situations. Data of this type for essentially core-shell latices will be presented and compared to dynamic mechanical thermal analysis results for the same materials. The influences of annealing time and temperature on the morphology of films cast from these latices have been investigated by MTDSC, which has also been used to detect the Tg of latex particles in the original latex form. Comparison of these latter results with those for dried latex will be made.

References

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