

## Book Review

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*Thermal Analysis in Polymer Characterisation*, edited by Edith A. Turi, Heyden, Philadelphia, 1981, 159 pp., \$27.00

This volume contains selected papers presented at the Eastern Analytical Symposium in New York City, November, 1980. There are eight articles in the volume by exponents of the art of thermal analysis, demonstrating the effective use of these techniques in polymer characterisation. The distinguished authors have managed to provide previously unpublished data in such a way that the material gives an overall view and explanation, which makes the volume helpful to those meeting the topic for the first time. The subject is such that it will appeal to those in industry, in research, and in university. As Dr. Edith Turi points out in the Foreword, thermal analysis 'is the primarily utilized method in the characterisation of polymeric materials and gives information often unobtainable by other techniques'.

The volume opens with an article by B. Wunderlich on 'Determination of the History of a Solid by Thermal Analysis'. He points out that measurement of equilibrium properties does not permit evaluation of history. However, thermal analysis does provide data on metastable states and in this article the author concentrates on changes found in glasses and semi-crystalline polymers which can be related to the history of the sample.

W.M. Prest, D.J. Luca and F.J. Roberts discuss the capabilities and application of a computer-controlled differential scanning calorimeter. They point out that the accuracy and flexibility of commercial thermal analysis instrumentation can be markedly increased by the application of computer-assisted data acquisition and system control techniques. These techniques are applied to the determination of the temperature dependence of the aging processes in polystyrene and polycarbonate glasses and to the evaluation of the compatibility of blends of poly(2,6-dimethyl-1,4-phenylene oxide) and polystyrene.

J.H. Flynn presents his usual sophisticated analysis of the kinetics of thermogravimetry in polymer systems and discusses how to overcome complications of thermal history. He shows how these differences arise and how they affect the kinetic parameters. The degradation of polystyrene in vacuum is used as an illustrative example.

The effect of the diethylene glycol content of polyethylene terephthalate on its thermal transitions is reported by E.A. Turi, Y.P. Khanna and J.A. Bander. Process studies on the manufacture of polyethylene terephthalate (PET) show that some processing conditions cause the undesirable formation

of diethylene glycol (DEG) units in the polymer chain. The data reported in this paper point out important correlations between the DEG content of the polymer and its thermal transitions.

A review of the effect of polymer structure on enthalpy recovery in glasses by J.M. O'Reilly updates this topic. The main parameters which characterise the enthalpy recovery are the temperature dependence and structure dependence of retardation times. The article refers to organic glasses, polymers and inorganic glasses.

Shu-Sing Chang provides a paper on the specific heat of thermosetting resins with special reference to a study of phenolic resin by automated adiabatic calorimetry and differential scanning calorimetry. The specific heat was determined using an adiabatic calorimeter over the temperature range 4–370 K and using the DSC unit up to 450 K. A summary of the specific heat of thermosetting resins, cross-linked polymers and varnishes is provided for the temperature region 0.1–500 K.

A new thermal analysis technique to quantitatively characterise complex composites (rubber, toughened plastics) is described by H.E. Bair, L. Shepherd and D.J. Boyle. Calorimetric analysis showed that the magnitude of  $\Delta C_p$  at  $T_g$ , for the PBd phase of SAN copolymers grafted to PBd, was reduced non-linearly as the ratio of SAN to PBd was increased.

A final article by P.H.C. Shu and B. Wunderlich is on the thermal properties of polymeric selenium. This attempts to correlate the molecular structure to the macroscopic thermal analysis.

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