MICROWAVE AND CONVENTIONAL CALORIMETRY OF UNSATURATED POLYESTER AND URETHANE ACRYATE RESINS AND THEIR BLENDS

R.J. Day and S. Petchuay,
Manchester Materials Science Centre, UMIST, Grosvenor Street, Manchester M1 7HS, UK

Unsaturated polyester resins are normally very brittle materials that are not readily toughened by conventional methods of rubber toughening, for instance by incorporation of toughening particles. They are readily blended with urethane acrylate resins and the copolymers are much tougher than the cured unsaturated polyester resin alone. In this work the structure and properties of the two resins and of a series of blends have been studied. The materials have been cured using conventional thermal methods and also microwave heating. The development of structure in the materials has been followed by light scattering and scanning electron microscopy. The toughness of the blends prepared using conventional and microwave heating has been evaluated.

The curing reactions of the catalysed, as-received resins and their blends have been followed using differential scanning calorimetry and microwave calorimetry. The reaction kinetics have been determined from this data using a variety of approaches. These show that the microwave-induced reactions have a higher activation energy than the conventionally induced reactions. The frequency factor is higher, however, for the microwave-induced reactions. Further analysis of data shows that the structure of the blends does not change uniformly as the composition does, but there is a change in the structure over the range 40-60 % polyester content. Either side of this the structure of the blend appears to be similar to that of the majority component. Dielectric measurements, made simultaneously to the microwave calorimetry also reveal this effect.