ABSTRACTS OF 1994 PRIZE WINNING POSTERS

FIRST PRIZE:

A NOVEL CCD-BASED POLYMER FIBRE X-RAY DIFFRACTOMETER

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In X-ray diffraction experiments the diffraction is sampled from *hkl* planes whose reciprocal lattice points lie on the surface of the Ewald sphere. For most uniaxially oriented polymers the chain axis lies parallel to the fibre axis. Consequently, in the fibre diffraction transmission photography arrangement most commonly used (with the X-ray beam normal to the length of the fibres), the meridional diffraction cannot theoretically be accessed because of the curvature of the Ewald sphere. Tilting the fibre allows access to the meridian one point at a time, but quantitative interpretation of the results presents difficulties.

A diffractometer based on a scanning X-ray sensitive CCD (charge-coupled device) has been developed for studying highly uniaxially oriented polymer fibres. A three-circle goniometer allows the detector to take snap-shots at different positions in reciprocal space and hence equatorial through to meridional diffraction may be accessed. These images are mapped from detector space to reciprocal space and then combined to form an undistorted composite diffraction pattern which is linear in reciprocal space.

SECOND PRIZE:

FOLLOWING PHASE SEPARATION KINETICS DURING THE FORMATION OF FLEXIBLE POLYURETHANE FOAM USING SYNCHROTRON SAXS

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The kinetics of microphase separation during the processing of flexible polyurethane foam have been investigated. Forced-adiabatic, time-resolved Synchrotron SAXS experiments were employed to probe structure development during processing. Microphase separation was observed to occur at critical conversion of isocyanate functional groups and shown to follow the kinetics associated with spinodal decomposition. The isocyanate conversion at the microphase separation transition (MST) was in good agreement with our previously reported FT-IR results. From the scattering data, $R(q)$, the amplification rate of the composition fluctuations was determined. The data have been analysed in terms of a time dependent Ginzburg-Landau model (TDGL). Plots of $R(q)/q^2$ versus q^2 exhibited a maximum at a finite value of scattering vector (q). These observations were in qualitative agreement with the theoretical predictions of the TDGL theory.