# A STUDY OF CRAZING BEHAVIOR OF POLYSTYRENE POLYMERS

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Deformation of amorphous polymers prior to total fracture can be divided into four categories. These are elastic and inelastic deformation, shear plasticity and crazing. Unlike cracks, crazes are load bearing, since their surfaces are bridged by many fine (5-30 nm diameter) fibrils. As the crazes grow in width this fibril structure may break down, leading to large voids which eventually grow to become cracks of critical size. Crazing occurs more commonly in amorphous, glassy polymers such as polystyrene.

The broad aim of this study was to investigate the crazing behavior of polystyrene. To produce thin films required for craze analysis, a glass slide was dipped and drawn slowly by using a motor driven lifter through a solution, 14% of polystyrene in toluene. Some slides were drawn twice through the solution to increase the film thickness. The slides were then left overnight in a fume cupboard to allow toluene to evaporate. Then the slides were dried in a desiccator vacuum oven at 85°C for 12 hours for complete evaporation of toluene from the films. The samples used in this study were rectangular shaped films (40 mm x 15 mm). The film was cut into an appropriate size and stripped off the substrate onto the surface of a water bath. The thickness of films was measured by using the Michelson interferomter.

In the constant extension rate test, a cut of 10 mm was initiated along the centre line of the sample by using a scalpel blade which was held perpendicular to the plane of the film in order to give a sharp tip to the initial crack. The two free ends were then separated at a constant rate. The tip of the crack (fig-a) was observed through a reflection microscope.

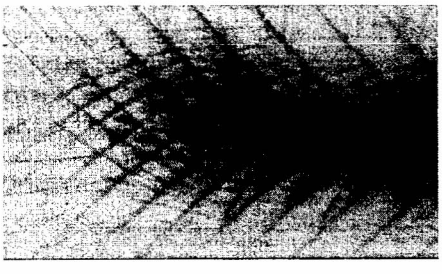

Fig-a

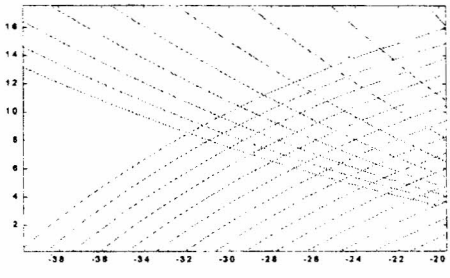


Fig-b

Slip line fields which are similar to those of polystyrene film, were generated (fig-b) by using a software program (MATLAB) to fit the experimental results to analytical functions that will be of great use in craze analysis.