STUDIES ON PROPERTY-STRUCTURE CORRELATIONS IN POLYETHYLENE TEREPHTHALATE FIBRE

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CERTIFICATE

This is to certify that the thesis entitled "STUDIES ON PROPERTY-STRUCTURE CORRELATIONS IN POLYETHYLENE TEREPHTHALATE FIBER" being submitted by Mr. C. Ramesh, to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in the Department of Textile Technology, is a record of bonafide research work carried out by him. Mr. C. Ramesh has worked under our guidance and supervision and fulfilled the requirements for the submission of the thesis.

The results contained in this thesis have not been submitted, in part or in full, to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

Poly(ethylene terephthalate)(PET) fibres with a wide range of structure and morphology were prepared by heat-setting commercial PET yarn in a silicone oil bath for 5 minutes under taut and free to relax conditions. Structure and morphology of these samples were characterized using standard techniques. Takayanagi's unit cube model was used to identify the connectivity between the crystalline and amorphous phases. Melting behaviour of these samples were characterized by DSC measurements. The differences in the melting characteristics of the two sets of samples were interpreted in terms of structure and morphology.

Structural changes occurring during uniaxial deformation were studied by FTIR using film samples, which were prepared in a similar technique. The dependence of the deformation mechanism on the initial structure of the sample was discussed.

The viscoelastic behaviour of these samples was studied through stress-relaxation measurements. Superposition principle was applied to these stress-relaxation data to obtain the stress-relaxation master curves. Alfrey approximation was used to compute the stress relaxation time spectra.

Studies are also presented on the room temperature recovery behaviour of these samples. The recovery parameters were correlated with the structural and morphological parameters. The information obtained from FTIR studies was used to explain the recovery behaviour of the fibres.

A method for determining the crystallite orientation accurately for PET fibres from $(\bar{1}05)$ reflection was outlined.

Transverse modulus of heat-set PET fibres were measured and compared with torsional and extensional moduli.

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