RADIATION INDUCED GRAFT - COPOLYMERISAT OF METHYL METHACRYLATE ON NATURAL / MODIFIED WOOL

BY
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CERTIFICATE

This is to certify that the thesis entitled "Radiation induced graft-copolymerisation of methyl methacrylate on natural and modified wool" being submitted by Mr. R.K. Sadhir to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Textile Technology, is a record of bonafide research work carried out by him. Mr. R.K. Sadhir has worked under my guidance and supervision and has fulfilled the requirement for the submission of this thesis which to my knowledge has reached the requisite standard.

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

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ABSTRACT

Gamma rays induced graft-copolymerisation of methyl methacrylate (MMA) onto wool fibres (Indian Malpura wool) and the structure and property evaluation of graft copolymers forms the basis of the present thesis. The effect of radiation dosage, solvent and chemical modification of wool (i.e. reduction, methylation, oxidation and cross-linking) on the extent of grafting was investigated. The grafting efficiency was found to be maximum in methylated wool. The molecular weights of the grafted chains determined after separation from the wool were found to be higher than the homopolymer formed under the same reaction conditions. The grafted wool samples were characterised by elemental analysis and ir technique.

α - β transformation were studied by X-ray diffraction by extending the fibres to various % extension. Such transformations were found to be inhibited in grafted samples. The average crystallite size increased and the degree of orientation decreased with the extent of grafting.

Scanning electron microscopy (SEM) was used to examine the topography, peeled surfaces and cross-sections of the grafted wool samples. On the basis of X-ray and SEM data, it has been concluded that the grafted polymer is present in the cortex as well as in the medullae of the fibres.

Sorption and desorption studies of all the samples was carried out and the data was analysed in the light of Hailwood and Horrobin equation. Mechanical properties of pure and medullated wool fibres grafted with MMA were investigated in both water and air. The deposition of the rigid polymer increased the slopes in Hookean, yield and post-yield region. Bulk resilience and elastic recovery were also determined. The density of the fibres decreased with the extent of grafting.

Thermal behaviour of the grafted samples was evaluated by TGA in air and DTA in nitrogen.

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