

MODIFICATIONS OF ACRYLIC FIBRES

By
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in fulfilment of the requirements
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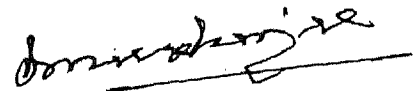
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CERTIFICATE

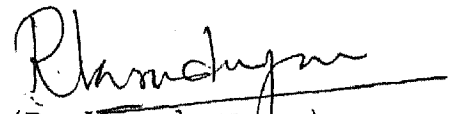
This is to certify that the thesis entitled, "MODIFICATIONS OF ACRYLIC FIBRES" being submitted by Mr. Santanu Bhattacharya, to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in the Department of Textile Technology is a record of bonafide research work carried out by him. Mr. Santanu Bhattacharya has worked under our guidance and supervision and has 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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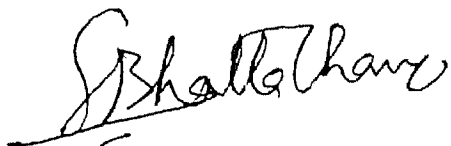
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ABSTRACT

Acrylic fibres having acrylonitrile, methyl acrylate and sodium styrene sulfonate as a third comonomer, were hydrolysed using aqueous solution of sodium hydroxide. The effects of various parameters, viz., sodium hydroxide concentration, time and temperature, on the extent of hydrolysis have been studied. The different structural transformation incurred due to hydrolysis have been evaluated by chemical analysis, infra-red spectroscopy. Different hydrolysis mechanisms have also been proposed. The structure-property relationships of various hydrolysed fibres have been established by evaluating their intrinsic viscosity, density, X-ray analysis, water imbibition property and tensile property.

Taking into account the hydrophilicity generated in the hydrolysed acrylic fibre, their blood compatibility has also been investigated in terms of thrombus formation and hemolysis study.

Chemical modifications of acrylic fibre have been carried out by treating the fibre with liquor ammonia and peroxide solution in different proportions. Such modified fibres have been characterized by their chemical analysis, infra-red spectroscopy, density and intrinsic viscosity

measurement, moisture regain, imbibition property and tensile property. These chemically modified acrylic fibres have been dyed with three different acid dyes. Their dyeing behaviour has been studied at different pH of the dye solutions. Wash fastness properties of the dyed fibre have been presented.

Synthesis of calix(8)arene and debutylated calix(8)arene and their characterization by infra-red spectroscopy and ^1H NMR have been carried out. Calix(8)arene and debutylated calix(8)arene moieties have been anchored on the hydrolysed acrylic fibres. These products have also been characterized. Metal ion (Cu^{2+}) adsorption and desorption capacity of such products has been studied.

The thermal degradation of various hydrolysed acrylic fibres have been studied by DSc analysis. Different products obtained by treating hydrolysed acrylic fibre and calix(8)arene under different conditions were subjected for their thermal degradation study. Thermal degradation mechanisms of these products have been suggested.

The dyeing behaviour of hydrolysed acrylic fibres have been studied by three different basic dyes and disperse dyes. The rate of dyeing and diffusion coefficients have been related to the molecular size of the dye molecules as

well as structure of the hydrolysed fibres. The wash fastness data of the dyed fibres have also been presented. The surface structure of different hydrolysed fibre have been presented by SEM micrograme. Calix [8]arene and their products with hydrolysed fibres have also been presented.

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