CHAPTER 1

INTRODUCTION

Wool, cotton and their blends are common for apparel fabrics. Wool has warmth, absorbancy, resilience and wrinkle resistance. However, shrinkage during washing is a limitation of wool and requires more care and maintenance. Cotton on the other hand has a good tensile strength, durability and resistance to severe treatments in normal use, but it has less resistance to creasing and some shrinkage during washing.

Blending natural fibres with synthetic fibres is one of the ways by which the drawbacks of the natural fibres can be reduced and the performance of the fabrics is improved. For the natural fibres the application of chemical finishes is another method, normally used to improve the performance. The purposes of finishing have been specifically given by Fortess (43) and Marsh (77). Finishing improves aesthetic qualities and imparts specific functional properties. It imparts easy care characteristics and improves durability and service.

Finishes can penetrate into, adhere to or react with fibres. The chemical finishes include synthetic polymers which are of two types; thermoplastic polymers and theromsetting polymers. Thermoplastic are those polymers which consist of long linear molecules accompanied by some branching but not interconnected (i.e. crosslinked) from molecule to molecule.

Acrylics are included in this class of thermoplastic polymers. Acrylic monomers include acrylic and methacrylic acids and their salts like esters, amides and nitriles. Any one of these alone or in combination will undergo addition polymerization. There is an increasing interest in acrylic products including acrylamide. Acrylamide is the parent compound of a large class of monomers that includes methacrylamide, $CH_2 = C(CH_3)CONH_2$, and scores of N - substituted derivates, $CH_2 = CHCONR'R''$. Acrylic resins differ from other forms of resins by nature of their transparency, great elasticity, adhesive qualities and resistance to most reagents and solvents. Acrylic finishes are also used as an additive treatment for the shrinkage contorl in woollen fabrics.

Shrinkage of woollen fabric is caused either by relaxation of finishing strains, or when moist wool is submitted to any form of mechanical action which applies alternate compression and relaxation to it. Two methods became apparent for attaining shrinkage contorl in wool fabrics: (i) removal or alteration of portions of the epidermis, particularly the scale overlap by either chemical or physical means, (ii) addition to the fibre of a meterial which will penetrate into, adhere to or react with the wool fibres, thereby altering their frictional and plastic behaviour.

Shrinkage which takes place in cotton is partially due to the severe stretching of cotton goods during their manufacturing and partially due to the swelling produced on wetting which

brings about an internal rearrangement of the material resulting in external shortening (15). The poor crease resistance in cotton is because of the weak Van der Waals forces and hydrogen bonds, these are incapable of pulling the fibres back to their original form due to weak intermolecular binding forces. Marsh (76) has pointed out that all crease resistant finishes also help to make the cotton fabrics shrink-resistant.

Cotton can be modified and improved for its performance, (i) by preparing cellulose derivatives as cellulose ethers and esters, (ii) by preparing crosslinked cellulose with resin treatments, (iii) by preparing branched cellulose using graft polymerization technique. (Grafting imparts to cotton certain desirable properties without adversely affecting the useful properties), and (iv) in situ polymerization of simple monomers which can be applied with suitable catalytic system using conventional processing, that is pad - dry - cure.

Studies have been carried out here, in the Department of Clothing and Textiles, using acrylic monomers to improve the performance of cotton, cotton-polyester blends and wool fabrics. Acrylamide has been used by Jain (60) using glyoxal and hydrogen peroxide as a redox catalytic system to bring about an in situ polymerization of the finish. Acrylamide with glyoxal and mixed redox catalytic system, of sodium thiosulphate, ammonium persulphate and hydrogen peroxide, was used by Modi (80) and it was reported that abrasive wear of textiles was thereby improved. Bhargava (9) and later Srivastava (100) have reported an

improvement in the shrinkage control properties of wool fabrics when treated with acrylamide finish. Kunzru (69) studied the effect of acrylamide finish under acidic condition on the wash and wear performance of cotton and polyester textiles, and reported that wrinkle recovery of fabrics was improved. Chaudhary (14) used acrylic finish using formaldehyde and epichlorohydrin and reported that set properties of fabrics were improved. A combination of thermoplastic and thermosetting finishes was studied by Phadke (68), who noted that the thermoplastic finish (in comparison) gave an ease of ironing and better retention of appearance of fabrics.

It is possible that wool and wool blend fabrics would like cotton fabrics have a good performance when treated with thermoplastic finishes. Work was thus planned to study the effect of acrylamide finish on shrink - resistance and other physical properties of textiles.

Since the application of thermoplastic finish such as acrylamide can impart set due to the thermoplastic nature, set properties can be improved if the fabric is kept in the required configuration of a garment during curing. Hence, pleated skirts were included in this work to see the utility of this finish on garments.

The synthetic fibres due to thermoplasticity can be heat set but natural fibres cannot be heat set as these have no themoplasticity. This attempt was thus to see if set properties could be imparted to wool, cotton and their blend fabrics.