SUMMARY AND CONCLUSIONS

Polyester possesses various desirable qualities but its undesirable qualities like lack of hydrophilicity, static electricity and oleophilicity make it uncomfortable. Present dissertation deals with chemical modifications to impart hydrophilic and other related comfort properties to polyester textiles.

Chapter I deals with the structure, properties and synthesis of poly(ethylene terephthalate) and the various factors governing the clothing comfort of a textile material are discussed. These include:

- Absorption and transport of liquid water;
- Water vapour permeability;
- Air permeability;
- Heat transfer;
- Static electricity;
- Soiling and soil-release; and
- Aesthetic comfort.

Chapter II reviews various approaches, followed to impart clothing comfort to polyester. They are broadly classified into following three categories:

(a) Manufacture of modified polyester by incorporation of hydrophilic compounds into polymer backbone;
(b) Grafting of hydrophilic monomers onto polyester; and
(c) Topical finishing treatments with chemicals which impart hydrophilic character to polyester.

Chapter III deals with experimental studies on alkaline hydrolysis of PET and the characterization and correlation of its various physical, mechanical and physicochemical properties.

- **Physical Properties**

Alkaline hydrolysis results in loss in weight of polyester. Weight loss proceeds linearly with the treatment time and non-linearly with concentration of alkali solution and temperature. The relative effectiveness of reaction parameters towards hydrolysis of polyester, indicated by weight loss decreases in the order: temperature > concentration > treatment time. Alkali removes the outer skin of the fibre/filament and makes it progressively thinner. This results in a decrease in diameter or denier of the fibre making the fabric structure more porous and increasing the air permeability of the fabric.

- **Mechanical Properties**

Hydrolytic degradation leads to the gradual reduction in strength of the fibre/filament with increasing severity of treatment. Strength-loss increases linearly with the weight
loss, with a slope greater than unity. The stiffness of the fabric, measured as 'Flexural Rigidity' decreases with increasing weight loss in the treatment indicating a softer (silk-like) feel to hydrolyzed polyester fabrics.

- **Physicochemical Properties**

  Vertical wicking height (VWH) of polyester fabric was found to increase exponentially with the wicking time. At all concentrations, it increased with treatment time, reached a maximum and then showed a decreasing trend with further increase in time. The treatment time corresponding to maximum was noted to decrease with increasing concentration of alkali. Water contact angle of PET filament and film decreases in the process of hydrolysis indicating a higher surface hydrophilicity for hydrolysed fabrics. Alkaline hydrolysis degrades polymer chains and generates carboxyl and hydroxyl groups on the fibre/filament surface improving water transport properties and basic dye uptake of the fabric. Moisture regain remains almost constant indicating that the alkaline hydrolysis does not improve the bulk hydrophilicity of the polymer. The average molecular weight does not change significantly. Treated fabric removes 94% of soil while the untreated removes around 73% of the soil.
Effect of Catalysts

Under similar reaction conditions, addition of catalyst in alkali solution increases weight-loss and strength loss. The dependence of strength loss on weight loss is non-linear. Catalytic hydrolysis decreases flexural rigidity more than that obtained with only NaOH and thus provides a better feel to the polyester fabric.

Chapter IV deals with the reaction of Na-glycolates with polyester with a view to producing hydroxyl end groups on the fibre surface and characterization of fabrics for their important physical, mechanical and physicochemical properties.

Weight Loss

The dependence of weight loss on treatment time is linear while on concentration it is non-linear. The weight-loss increases in the following order: $\text{SEG} \ll \text{SLEG} \ll \text{STEG}$

Strength Loss

The dependence of strength loss on weight loss is non-linear. It increases in the order: $\text{SEG} \ll \text{SLEG} \ll \text{STEG}$. 