Preface

Physicochemical methods have been used widely to investigate cellulose-aqueous medium interfaces. These investigations have given a lot of valuable information for understanding and standardizing different chemical processing operations during the manufacture of cellulosic textiles. Thus, the importance of physicochemical studies has been realized well, but it is surprising that due attention has not been paid to some important cellulose-aqueous medium interfaces. For example, very little amount of work has been reported on:

(1) Electrokinetics of resin-treated cellulosic fibres-aqueous electrolyte systems.

(ii) Chemically modified reactive dyed cellulosic fibre-aqueous electrolyte systems.

In the present thesis an attempt has been made to investigate some aspects of the two above-mentioned systems. For the convenience of presentation, the present work has been divided into two parts. The first part deals with zeta potential studies of crosslinked, chemically modified and chemically modified-reactive-dyed cotton fibres-aqueous electrolyte systems. Some preliminary studies on surface
potential at the interface between cellulose and solution of crosslinking agents have also been included in this part. The second part deals with the sorption of reactive dyes in presence of different electrolytes, in an attempt to modify the interface between cellulose and reactive dye solution to achieve better exhaustion.

A necessary theoretical background and review of the work done in the past on zeta potential and surface potential of cellulose fibres is given in chapter I.

Three commercially important crosslinking agents viz. dimethylolethylene urea (DMEU), dimethylolproplylene urea (DMPU) and dimethylololhydroxyethylene urea (DMEHPU) were selected for the present studies. Streaming potentials were measured at the interface of different crosslinking agents-chemisorbed cottons and untreated cotton-electrolyte solution systems. Data were obtained as a function of the concentration of crosslinking agents and concentration of different electrolytes, viz NaCl, NaI, KCl, and KICl. The measured streaming potentials were used to calculate zeta potentials, which in turn were used in calculating the surface charge density. The origin of surface conductance
has also been investigated for better understanding of the structure of electrical double layer. The results of these investigations are reported and discussed in chapter II.

The exhaustion and fixation of reactive dyes can be improved by modifying the structure of cellulose in such a way, that opening up of the structure is affected, and/or more active centres are generated, where dye can react. The potentialities of this approach have been explored in chapter III. Cotton cellulose was modified chemically with the help of different reagents. The electrokinetic behaviour and equilibrium adsorption of reactive dyes on these fibres were studied in an attempt to establish a correlation between the two.

By various electrokinetic methods it is possible to measure the zeta potential of the surface, but this is not the true surface potential. The total potential difference between fibre-water interface and the bulk of the solution is ordinarily not susceptible to physical measurements. All available methods involve movement of the fibre and solution relative to one another, and since solvent molecules adjacent to the solid surface are firmly attached to it, the shearing
and movement take place at some distance from the true interface and the potential measured is that, pertaining to this point. Much is not known of the potential variation closer to the fibre surface, so that the true potential may be quite different from the zeta potential. However in the present work surface potentials at the interface of cellulose/cellulose acetate and the solution of crosslinking agents have been studied as a function of the concentration of crosslinking agents, concentration of MgCl₂·6H₂O and pH, directly by monolayer technique. The results of these preliminary investigations have been reported in chapter IV.

Dye-bath additives can be used to modify cellulose-dye solution interface. Some suitable modifications can lead to better exhaustion and thereby better fixation of reactive dyes can be achieved. To study this possibility different electrolytes were used to modify the fibre-dye solution interface and the equilibrium adsorption of few selected reactive dyes in the presence of these electrolytes were studied. The thermodynamics of adsorption of these reactive dyes was also studied in presence of those electrolytes, which gave higher exhaustion. These investigations are
reported and discussed in part II (Chapter V) of this thesis.

All chapters are divided into sections and sub-sections like, introduction, experimental, results and discussion. References are given at the end of each chapter arranged in the order as they appear in the text.

The work reported in the present thesis was carried out during the period 1973-76. By subsequent employment and loss of close contact with ATIRA, delayed the thesis submission beyond expected limits. However, there is a positive side of it, that all the work reported herein has not only been published in reputed journals, but also has been referred by other workers in their recent publications.