CHAPTER 1

INTRODUCTION

Polyester is one of the versatile manmade fibres finding its use from apparel to industrial field. Polyester apparels are becoming more popular in these days. Poly(ethylene terephthalate) (PET) fibre is today the most widely manufactured fibre having overtaken polyamide fibres (Koslowski, 1993). Its fifty years by existence has recently reviewed in a commemorative book (Brunschweiler and Hearle, 1993). In India production of polyester has been a fast growing area. However, Polyester suffers from the deficiency as far as comfortability is concerned. In this regard, many suggestions have been considered by the producers. Thus efforts are on the way for its scientific modifications so as to impart greater comfort, good draping qualities, improved moisture regain and a more natural silky appearance. In this context, it was felt by the fabric manufacturers to adopt ways of improving aesthetics by imparting silky feeling to polyester in particular use for apparels, dresses, ties etc. Japanese research workers came out successfully with a pioneering work in developing a silky polyester.

There are three ways of modifying the polyester to impart silky feeling: (a) modification of the cross-section of the fibres (b) production of the fine denier filament; they are more effective in producing elegant gloss and soft hand, and (c) after-treatment of polyester textiles.

It was in the year 1952, ICI came out with a patent disclosing the action of sodium hydroxide on polyester giving silky feeling, and was supported by other patent Dupont Co. in 1958. As was disclosed in the patent, by treating polyester with sodium hydroxide, polyester loses its
weight progressively as the regular monofilament is reduced to fine denier and leaves scars on the filament surface.

Among the three stated ways of producing silk-like polyester, the first two, which modify the fibre and yarn forms respectively, are found to end up with high costs. On the contrary, the weight reduction of polyester, as disclosed by the ICI patent, is not only less expensive, but also results in improved comfort properties. The weight reduction of polyester is nothing but saponification of terephthalic ester, caused by sodium hydroxide. Under predetermined conditions, alkaline hydrolysis involves the progressive peeling of polyester surface resulting in loss of weight, yet the favourable properties of it remain unaltered. The main feature of this treatment is that no special equipment is required for application.

Weight reduction of polyester has been viewed from both industrial and research point of view by various research workers as detailed in review of literature. It was in 1989 that an extensive review on the surface modification was presented by Zeronian and Collins. A successful attempt highlighting the potential of alkaline hydrolysis as a tool to investigate the structural aspects of polyester was a major breakthrough in the polyester research. On the other hand, an objective evaluation method was developed by Matsudaira et al., (1992) for silk from the basic mechanical properties. Fabric handle, using KES-F developed by Kawabata and Niwa (1975) has been in existence for the past twenty five years.

A considerable amount of work has been carried out on the surface modification of polyester fibre to improve the characteristics, and to explore the possibility of it as a tool to understand structural aspects. It appears that investigations on certain aspects like; effect of heat setting temperature bath ratio, multiple hydrolysis etc., on fabric handle; effect of PET partially oriented yarn (POY), draw texturing parameters on the structural aspects studied through alkaline hydrolysis; study of the effect of spinning parameters on the behaviour of sewing thread etc., have not been reported.
Hence the present work endeavours to show how this treatment imparts silky feeling and also in improving comfort and exploring the possibility of using it as a tool to study the structural aspects of draw texturing and ageing process.

1. Investigation of the effect of draw texturing parameters on structural aspects of draw textured yarn modified by alkaline hydrolysis. The study involves the effect of primary heater temperature, draw ratio and d/y ratio on weight loss, density and CDT on 4 types of POY’s.

2. Investigation of the effect of spinning parameters like spindle speed, traveller weight and twist on the properties of 100% polyester sewing thread.

3. Investigation of alkaline hydrolysis to study the ageing phenomena.

4. Interpretation of the part played by alkaline hydrolysis in jute/polyester blended fabrics.


6. Investigation of the study of effect of heat setting temperature and bath ratio on low stress mechanical properties of 100% polyester dress materials.

7. The effect of boiling water shrinkage and repeated hydrolysis on the fabric handle is examined.

8. Investigation of the low stress mechanical properties of weight reduced polyester fabrics using ethylenediamine.