ABSTRACT

Chemical treatments on polyester is essential to get the absorbency character thereby leading for increased dyeing effect needed for comfort characters. Polyester / cotton blend (P/C blend) enters in market because it has the advantages of both PET and cotton (cellulose) and can be wearable. Fabric made from a P/C blend combines the strengths of the two fibers, like breathability, tear-resistant, and can be fashioned into abrasion-resistant garments providing much more comfort. The fabric worn next to skin should absorb sweat and help to maintain body temperature; and this moisture absorbing ability of a fabric directly determines the comfort characteristics of apparel. Hence, in this research work, it was decided to treat the polyester and polyester / cotton blended fabrics with suitable chemicals so as to receive the hydrophilic characteristics. 100% polyester fabric and polyester / cotton blend (65:35, 50:50 & 35:65) fabrics were selected and treated with sodium hydroxide (4% w/v) that were then subjected to different applications such as i) hydrophilic finish, ii) PVA treatment followed by hydrophilic finish, and iii) hydrophilic finish followed by enzyme treatment. The results of this works were compared with cotton fabrics subsequently. The treated and finished fabrics were then tested suitably for checking the hydrophilic character.

The treated polyester and their blend fabrics give good physical properties such as tensile strength, crease recovery angle and mean drape coefficient that are high in polyester fabric followed by its blend with cotton (P / C 65 / 35; P / C 50 / 50; & P / C 35 / 65). However, the stiffness (bending length) is less in polyester fabric compared with cotton and p/c blends respectively both in warp and weft directions.

The sodium hydroxide treated fabrics when applied with 1) PVA (1.5% w/v) followed by hydrophilic finishing; and 2) hydrophilic finishing followed by enzyme treatment (2% w/v), there is a remarkable increase in the wetting behaviour and also water retention character on polyester and P/C blended fabrics compared with hydrophilic finished only fabrics. Similarly, there is a very good wicking behaviour exhibited by these fabrics. The overall wicking behaviour is high in the enzyme treated hydrophilic finished fabrics followed by hydrophilic finished PVA treated fabrics and only hydrophilic finished fabrics. This trend is also subsequently seen in moisture vapour transmission (MVT) as well as air permeability character of these fabrics.

After the sodium hydroxide treatment and hydrophilic finish, there is only a insignificant difference in the value of tensile strength in these fabrics. The tensile strength of these sodium hydroxide treated fabrics is not altered much due to the hydrophilic finishing. The sodium hydroxide treated fabrics when applied with 1) PVA (1.5% w/v) followed by hydrophilic finishing; and 2) hydrophilic finishing followed by enzyme treatment (2% w/v), the change in the values is only negligible.

The smoothness is more for PET fabrics followed by P/C blended fabrics cotton fabrics respectively. The PVA treatment followed by hydrophilic finished, and hydrophilic finish followed by enzyme treatment give more smoothness compared to only hydrophilic finished sodium hydroxide treated fabrics. Due to the finishing treatments there is considerable reduction in the stiffness characters of the fabrics (PET, P/C blend and cotton (50 : 50)). The fullness behaviour is more on PET fabrics followed by P/C blend and cotton fabrics respectively. The hydrophilic finish followed by enzyme treatment and the PVA treatment followed by hydrophilic finishing give the considerable reduction in the bending length compared to only

hydrophilic finished sodium hydroxide treated fabrics. The hydrophilic finishing treatment increases the crease recovery angle considerably on these fabrics.

There is a good increase in the k/s values on the basic dyed & reactive dyed sodium hydroxide treated and hydrophilic finished PET fabric with more cotton portion. There is a steady increase in the k/s value of these fabrics when subsequently finished. However, the trend is quite opposite for the disperse dyed fabrics. Similar to the k/s value (dyeing effect) the fastness values (washing, light & rubbing) also follows the same trend with respect to the dye uptake on these treated fabrics.

All these treated samples show a higher zone of inhibition against staphylococcus aureus when compared to escherichia coli. In general, the polyester fabric shows a higher zone of inhibition (both by staphylococcus aureus and escherichia coli) followed by P/C blended fabrics and cotton fabric. The rate of inhibition is increased in both the cases (Staphylococcus aureus and Escherichia coli) when the sodium hydroxide treated fabrics are applied with hydrophilic finish.

The PET fabric with only sodium hydroxide treatment shows the higher static charge value (0.10 KV). The PET fabric, when blended with cotton (P/C; 65:35, 50:50 & 35:65) and applied with the finishing chemicals (sodium hydroxide in addition with PVA, hydrophilic finish and enzyme), there is a drastic decrease in the accumulation of static charge.

The UV protection factor (UPF) values are almost excellent for polyester fabrics. When the polyesters are blended with cotton the UPF rating is correspondingly reduced. However, when these fabrics are treated with the finishing chemicals the UPF rating is also subsequently increased to very good level.

The SEM photographs of the treated fabrics show the effect of sodium hydroxide treatment on PET fabric. It shows the presence of the hydrophilic finishing agents adhered on the surface of the PET fabric. The FTIR graphs of the treated fabrics show about the effect of sodium hydroxide treatment on PET fabric and also the presence of the hydrophilic finishing agents on the surface of the PET fabric.

The DSC graph gives the information of the heat of fusion which was decreased after treatment of the fabrics with PVA, however, this value is increased after the finishing treatment with the application of hydrophilic finish on the alkaline PVA treated fabric and hydrophilic finish followed by enzyme treatment.