ABSTRACT

The present research work has been undertaken with a view to develop an improved dyeing method for dyeing yarns and fabrics of 100% Polyester, 80:20 PET / cotton blend using three different azeotropic mixtures of solvent mixtures.

In order to ensure that solvent treatments do not cause any detrimental effect on the strength of the treated polymeric materials used in the study various mechanical properties of treated materials have been studied before and after solvent treatments

SEM topography, FTIR analysis, and DSC and XRD studies were carried out to understand the changes if any caused in the physico-chemical behaviour of the treated samples due to solvent treatments. Also the fastness properties of the dyed materials were studied for the samples dyed before and after solvent pretreatments. The following conclusions are drawn from the study.

➢ The solvent pre-treatment of yarns and fabric samples of 100% PET 80:20 PET/cotton blends has resulted in the increase in the denier of the treated materials. As the pretreatment time increased, the denier of the samples also increased.

➢ The results of tearing and tensile strength measurements show that the strength of treated fabrics got improved up to certain time of treatments beyond which there was a small reduction in the strength of the treated materials.

➢ The abrasion resistance of the solvent pretreated materials increased for samples pretreated for shorter durations of about 6-8 minutes beyond which it was found to decrease.
As the time of pretreatment increased the weight loss of the solvent treated materials increased. However this did not cause any serious damage to the strength of the materials studied.

Scanning Electron Microscopic studies show that as the time of solvent treatment increased, erosion propagated into interior of the fibre materials resulting in the formation of elongated pits or cavities on the surface.

FTIR of treated and untreated fabrics show that there is no introduction of any functional groups or alteration of the existing groups in the case of solvent treated materials used in the study.

Comparison of DSC of the treated and untreated fibre samples has shown that solvent induced crystallization which is inter-crystalline in nature has occurred.

XRD studies show that the solvent acted as a plasticizer in the non-crystalline region breaking intermolecular bonds and enhancing the segmental mobility of the polymer which induced crystallization leading to the formation of crystallites.

Pretreatments have improved the dye uptake of the fibre samples in comparison with the untreated samples even at lower temperature in comparison to conventional dyeing processes leading to savings in energy and hence savings in the dyeing cost.

Results of fastness studies show that the fastness properties of solvent pretreated samples got improved.