

A STUDY OF SELECTED FUNCTIONAL FINISHES ON SILK/LYOCELL BLENDED FABRICS

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ABSTRACT

After reviewing the past work which has been carried out on the characteristics of yarns and fabrics, silk and lyocell yarns were blended in different proportions. A series of yarns were produced with blends containing 100% silk (S 100), 75% silk and 25% lyocell (S/L 75:25), 50% silk and 50% lyocell (S/L 50:50), 25% silk and 75% lyocell (S/L 25:75) and 100% lyocell (L 100) and their important properties such as tenacity and imperfections were studied. In all, there were 5 yarn samples which were produced from silk and lyocell fibers. These yarns were converted to woven fabrics keeping the same fabric sett with a view to studying the low stress mechanical properties, comfort properties, antimicrobial effect, UV protection, aroma and softening efficiency on the developed fabrics. The fabrics were dyed with reactive dye, as reactive dyes are suitable for both silk and lyocell. The effects of blend compositions on low stress mechanical properties using KES-F system were examined. The results proved that lyocell rich blends showed good handle which was reflected by higher tensile, lower bending, shear and compressional properties. Total hand value of lyocell rich fabric was also found to be good. In terms of other mechanical properties, the tensile and tear strength values in respect of lyocell-rich blends showed an increase. Abrasion resistance and pilling were also found to be better for lyocell rich blends. Thermal resistance of the

fabrics containing silk showed a higher value in comparison with lyocell-rich blends. Water vapour permeability, absorbency and wickability for lyocell and lyocell-rich blends were found to be superior as compared to 100% silk fabrics. With respect to aesthetic comfort properties, drape of the lyocell rich fabrics was good in comparison with 100% silk fabrics. The effect of blend composition on dimensional stability and fabric smoothness appearance also showed that 100% lyocell fabric and S/L 25:75 blended fabrics performed better. The dye uptake of lyocell rich blends was found to be quite high as compared to 100% silk fabric. FTIR analyses of silk, lyocell and silk/lyocell blended fabrics showed the characteristic functional groups for the respective fabrics.

The fabrics containing 25% silk and 75% lyocell performed better in terms of various mechanical and comfort properties and overall the fabric exhibited excellent performance in comparison with the other blends. This fabric was taken further for application of silicone, antibacterial, UV and aroma finish.

Silicone softener finish on silk/lyocell 25:75 blended fabrics in terms of low stress mechanical properties has led to an improvement in tensile, bending, shear, compression, and surface properties in comparison with the untreated S/L 25:75 blended fabric. Total hand value of silicone treated S/L 25:75 blended fabrics also showed an improvement in comparison with the corresponding untreated fabric. The tensile strength and tear strength decreased and elongation increased for the silicone treated fabrics in comparison with the untreated fabric. Abrasion resistance and pilling showed an improvement for silicone treated S/L 25:75 fabrics. Air permeability, thermal conductivity, thermal resistance, water vapour permeability, absorbency and wickability values of the treated S/L 25:75 fabrics showed a decrease in comparison with the

corresponding untreated S/L 25:75 blended fabrics. Drape coefficient percentage, crease recovery angle, bending length and flexural rigidity showed an improvement for the silicone treated S/L blended fabrics in comparison with the corresponding untreated fabrics. Fabric smoothness appearance also showed an improvement for the silicone treated S/L 25:75 blended fabrics after laundering and dry cleaning. Characterization by SEM, EDX and FTIR analyses confirmed the presence of silicone on the fabric surface.

Silk/lyocell 25:75 blended fabrics were given antibacterial finish using aloe vera, UV finish using titanium dioxide and aroma finish using lavender microcapsules to further improve its functionality. The efficacy of the finish and wash durability of the finishes were studied.

Aloe vera finish showed a good zone of inhibitions up to 30 mm for *S. aureus* and *E. coli* bacteria. Aloe vera applied directly on the fabric had poor wash durability when compared to the corresponding silk/lyocell 25:75 blended fabrics treated with microcapsules of aloe vera. Microencapsulation method of finishing S/L 25:75 fabrics with aloe vera was found to have good antibacterial property and wash durability up to 25 washes. SEM, EDX and FTIR analyses confirmed the existence of aloe vera on the silk/lyocell 25:75 blended fabrics. Since, silk/lyocell blended fabrics as well as aloe vera was 100% from natural resources, it is thereby eco-friendly having economic, social and environmental benefits.

UV finish applied to S/L 25:75 blended fabrics using titanium dioxide led to a significant improvement of the UV absorbing activity of the TiO₂ treated fabrics in comparison with the corresponding untreated ones. Such positive results indicate the use

of UV resist silk/lyocell blended fabrics for protecting the body against solar radiation. These finishes were durable up to 25 washes. Characterization of treated fabrics with the untreated ones by SEM, EDX and FTIR analyses confirmed the existence of titanium dioxide on the silk/lyocell 25:75 blended fabrics.

Lavender treated silk/lyocell 25:75 blended fabrics performed well in terms of aroma finish. In the psychophysical assessment of the aroma finish, respondents in the survey provided very good ratings for pleasantness and intensity of the aroma. The participants also gave positive ratings for their interest in purchasing scented products. Organoleptic evaluation of odour control also gave good anti-odour results. When wash durability of the finish was evaluated subjectively after 5, 15 and 25 washes, the participants rated the intensity of the finish as good up to 25 washes. Characterization of lavender treated fabrics with the untreated ones by SEM, EDX and FTIR analyses confirmed the presence of lavender finish on the silk/lyocell 25:75 blended fabrics. Silk and lyocell possess similar properties in terms of lustre and strength. The cost of lyocell is nearly one third of silk and lyocell is an eco friendly fiber. Therefore, blending silk and lyocell will merge the richness of silk and softness of lyocell and give a techno-economic edge over other fabrics in the textile industry. Hence, the important industrial implications of the study have been fully addressed.