Polymerization-Crosslinking of Cotton Fabrics for Superior Textile Performance

신윤숙

전남대 자연과학대 의류학과

The new and improved procedures were investigated to achieve superior balance of strength and durable press (DP) performance. A 100 % cotton twill was treated by pad-dry-cure(PDC), wet-fixation(WF) and steam-fixation(SF) processes. The resins used are dimethyloldihydroxy-ethyleneurea(DMDHEU) and urea-formaldehyde(UF) as crosslinkers and N-methylolacrylamide(NMA) as a polymer builder. The resin mixture of a polymer builder and a crosslinker was used with the WF and SF processes, and the treated fabrics were compared with those from the conventional PDC (DMDHEU) process.

The performance properties including strength, abrasion resistance, stiffness, DP rating and wrinkle recovery angle (WRA) were evaluated. Results from fabrics treated with the WF and SF processes were compared with those from the conventional PDC process. Changes in fiber structure and accessibility, and resin distribution and penetration due to various treatment processes were studied. Techniques such as

scanning electron microscopy, dye staining with optical microscopy, moisture regain and dye sorption measurements, and infrared spectroscopy were used.

With the WF process, NMA/DMDHEU system with a 2.7:1 resin mixture ratio, gave improved tear strength retention by 80 %, breaking strength retention by 40 %, and abrasion resistance retention by 200 %, as compared to the conventional PDC (DMDHEU) process. The NMA/UF-52 (WF) system with 2.3:1 mixture ratio improved tear strength retention by 40 %, breaking strength retention by 20 %, and abrasion resistance retention by 160 %.

With the SF process, NMA/DMDHEU and NMA/UF-52 systems with 1:1.3 and 1:1.8 mixture ratios, respectively, produced fabrics with softer hand and higher strengths and abrasion resistance retentions than those treated with the WF process.

Results from the analysis of changes in fiber structure and accessibilities and of resin distribution and penetration indicated that improved performance of the WF and SF treated fabrics is due to (1) development of network polymeric crosslinks and fewer but more effective conventional monomeric crosslinks, (2) high level of resin penetration, (3) more uniform distribution of resins, and (4) open and swollen fiber structures in the treated samples.