Effect of curing temperature on shape memory polyurethane coated fabric

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Abstract: This study explores the impact of various curing temperatures on the shape memory behavior and the development of physical crosslinks in SMPU-coated woven cotton fabric. The fabric underwent a dip-coating process in an SMPU solution, followed by curing at temperatures of 100 ℃, 120 ℃, 140 ℃, and 160 ℃. It was found that the tear strength of the SMPU-coated fabric decreased compared to uncoated fabric due to reduced slippage between the yarns. SEM imaging demonstrated a consistent coating and effective SMPU bonding across the yarns. Notably, the fabric's recovery ability improved with increasing curing temperatures, which is attributed to enhanced physical crosslinking. The PEI-SMPU/cotton combination showcased superior memory capabilities, as evidenced by shifts in FTIR and Raman spectroscopy peaks, and this change was linked to improved wash durability. The findings reveal that the fabric's advanced crease recovery is due to the SMPU's elasticity near its transition temperature, its inherent shape memory effect, and the physical crosslinks formed with cotton. Compared to existing studies (referenced as Table1), this work shows a notable improvement in crease recovery ability at lower SMPU concentrations, suggesting potential applications in creating wrinkle-resistant, dimensionally stable, pattern-retentive, and smartly actuating textile products.

KEYWORDS: *SHAPE MEMORY, POLYURETHANE, SMART TEXTILE, CREASE RECOVERY.*

Table 1 Comparison of crease recovery with literature.

Finishing agent	Crease Recovery angle (°)	Reference
Alkoxysilane/melamine	160	(Schramm & Amann, 2019)
BTCA/Chitosan	257	(Hebeish et al., 2011)
Shape memory polyurethane	253	(Liu et al., 2008)
PEI based Shape memory polyurethane	305	This study

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