ON THE MECHANICAL PROPERTIES OF FABRIC WOVEN FROM YARNS PRODUCED BY DIFFERENT SPINNING TECHNOLOGY: YARN FAILURE IN WOVEN FABRIC

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A study has been conducted on the mechanisms of in-situ tensile failure of staple yarns during uniaxial tensioning as in a conventional revel strip test. The yarns were PET/cotton blends processed on ring, rotor and airjet spinning systems and then woven into plain or twill weave fabrics.

The load-extension behavior of each yarn was recorded for the in-fabric state as well as for the free state (out-of-fabric) and SEM comparisons were made of the fractured yarn ends obtained in the two states. It was noted that when the tensioned yarns became jammed between cross yarns before straightening, the fracture ends were abrupt, similar to those observed in near zero gauge length tests of free-state yarns. However, when fabric structure was such that tensioned yarns could straighten without cross yarn jamming, the resulting failure zones were considerably longer, with a mixture of fiber fracture and slippage similar to that observed in long gauge length tests of free-state yarns.

The interaction between yarn properties and weave geometry was shown to strongly influence the disturbance of cloth structure in the local region of an isolated yarn failure during fabric tensioning. The extent of such disturbance allowed for measurement of the stress recovery length of the failed yarn and showed its dependence on the cloth tightness and on yarn type.