

P73. Comparative Analysis of Yarns Long-Lasting Stress Relaxation

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Results of the empirical investigations of long-lasting stress relaxation of different types of yarns are presented in this paper. Three different types of fibres and yarns were taken for the experimental investigations: the multifilament polyester (PET) yarn with linear density of 29.9 tex, the cotton yarn with linear density of 25 tex $\times 2$ and the woollen yarn with linear density of 25 tex. These kinds of yarns were chosen with intention to test different structures of the yarns – multifilament (polyester), spun single yarn (wool) and spun doubled yarn (cotton).

The relaxation process was investigated at 4 different levels of stretching up to the fixed 3%, 5%, 7% and 10% elongation, duration of each experiment was 200 000 seconds. The stress relaxation curve was described by mathematical formula and was calculated from series of experimental points [1, 2].

The relaxation behaviour of different types of yarns differs and the rate of relaxation is different, too. In majority cases, the relaxation rate and the shape of relative relaxation curve depend on the level of strain. Despite the differences between types of raw material of yarns and differences of relaxation at the different level of strain, the long-lasting relaxation behaviour can be predicted by break-point of relaxation rate and two linear dependences of relative stress relaxation on logarithmic scale of time. The method earlier presented by authors [1, 2] has been proved and in all investigated cases, the positive result has been received. The break-point of relaxation rate was established in all cases – for all yarns and for all levels of strain. These investigations confirm earlier proposed hypothesis that the rate of stress relaxation in yarns after some time of relaxation changes and the decreasing of relaxation rate occurs in the area of 100-200 seconds after relaxations started. This phenomenon can be explained by the structure of polymers, but the deeper analysis of theoretical reasons of this phenomenon is required.

Keywords: *stress relaxation, yarns, textile.*

References:

1. R. Milašius et al. *FIBRES & TEXTILES in Eastern Europe* **6(108)** p. 53-55 (2014)
2. G. Laureckienė et al. *FIBRES & TEXTILES in Eastern Europe* **1(115)** p. 73-77 (2016)