Experimental analysis of cotton based textile surface modification influence on wear comfort

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Extended abstract content

This research focuses on multifunctional surface nano-coatings of cotton and cotton/polyamide textiles and impact estimation onto such day-to-day wear comfort properties as air permeability, thermal and vapour resistance, as well wearer perceptions and sensory evaluation of comfort.

Silica sol with TEOS precursor modified with the 7.5 wt% zinc acetate dihydrate [1] was used to modify organic cotton (81%) and polyamide (19%) blend yarn knitted socks, net cotton jersey and double jersey knitwear. The high UV protection ability and anti-microbial activity of functionalized cotton fabric samples, as well improved wear resistance attained by the used sol-gel process is discussed in previous publications [1-4].

The goal of this research is to adapt developed sol-gel process to knitwear assortment worn as a base layer or first to the body cloth layer.

The surface wettability of socks examined by the water contact angle measurement shows good water repellence of three samples after hydrothermal treatment (marked W) with consolidation temperature varying in range from 100 to 120^{0}C and consolidation time 8 minutes (Fig.1). At the same time before first hydrothermal treatment water contact angles are much lower for all three variants. Drop of vapour permeability in a range from 1.5% (W100/8) to 9% (W120/5) and air permeability drop down from 4.2% (W120/8) to 19.5% (W100/8) shows that combination of consolidation temperature 120^{0}C and 8 minutes processing time, for modification of socks with applied sol, is more favorable.

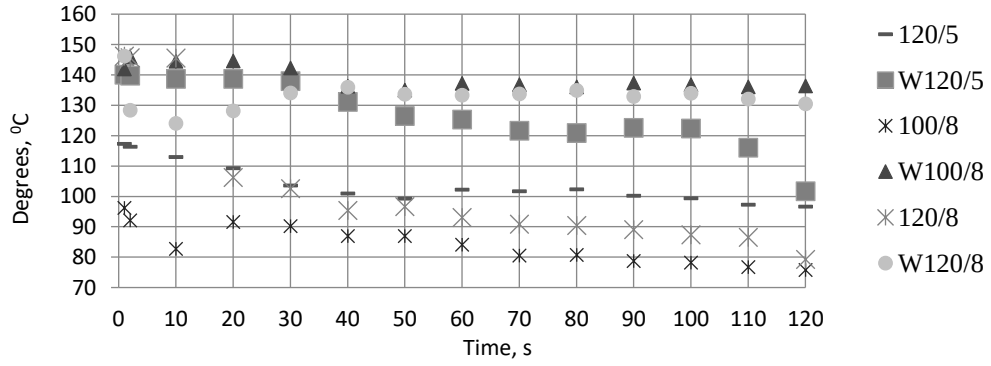

Figure 1. Water contact angle of modified and subjected to following hydrothermal treatment socks

100 volunteers of different age (Fig. 2) were engaged in the experimental wear, of whom 85 wore cotton T-shirts subjected to the processing, 15 respondents wore unprocessed ones. 66% of wearers perceived differences between unprocessed and sol-gel treated T-shirts and 26% noticed lack of sweat odour (Fig.4).

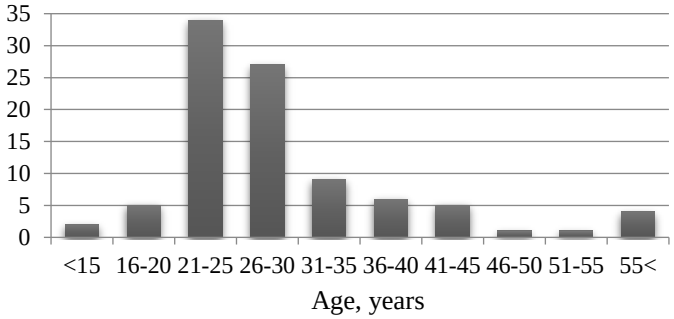

Figure 2. Age distribution of volunteers

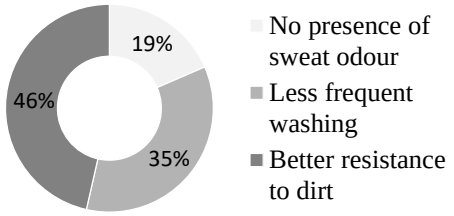

Figure 3. User perceived benefits

Increased resistance to dirt and need for less frequent washing, are the main advantages, named by T-shirt wearers (Fig. 3). Those, who are working ten and more hours, greatly appreciated all three mentioned benefits. Proposed applications ranged by experimental users shown in Figure 5

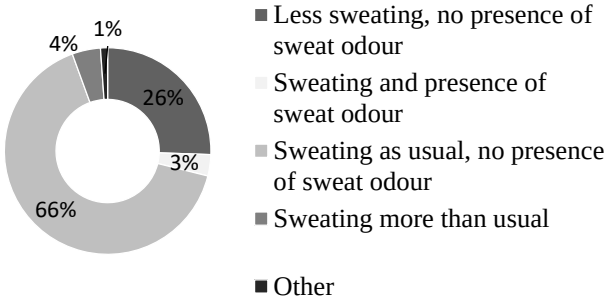

Figure 4. User observations

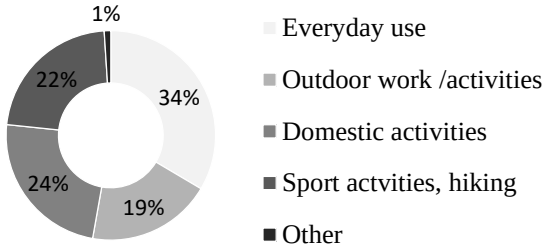

Figure 5. Distribution of T-shirt usage

Acknowledgments
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