

## Improving the moisture management properties of cotton fabrics with chitin nanofibers

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Effective moisture management of fabric will depend mainly on its ability to transport moisture away from the inner side of the fabric to the outer surface where more spreading and evaporation occurs. This will significantly enhance the drying rate while providing a cool and dry feeling to the wearer. Cotton has poor moisture management properties compared to other types of fabrics, primarily driven by low wicking rate and high moisture absorption capacity. Cotton has been subjected to partial carboxymethylation (pCM) through the reaction with monochloroacetic acid in the alkali medium to increase overall wicking property. Fabrics were treated with 2 M NaOH and 1 M monochloroacetic acid at 80 °C for 30 min. The reaction occurs in an alkaline setting where nucleophilic substitution between sodium cellulose and monochloroacetate takes place. FT-IR band emerging around 1734 cm<sup>-1</sup>, which was attributed to carboxylic acid groups confirmed the reaction. Chitinnanofibers (CNFs) were prepared by fibrillation of crab shell chitin using ultrasound technique and used as a side selective surface modifier through a special apparatus. The objective of this treatment is to increase the moisture absorbance capacity in one side of the fabric to facilitate moisture across the fabric structure. This surface modification was confirmed by SEM and AFM analysis. Modified fabrics showed improved wicking and spreading ability and higher water-binding capacity compared to untreated cotton fabrics. The pCM reaction shown to increase the wicking rate (at 10 min) by 27.4%. It was also seen that with the CNFs treatment of pCM cotton fabric, the moisture pickup ratio significantly reduced from 26.1 ± 3.8 % in cotton to 8 ± 1.7 % in pCM with 0.75 g/l CNFs (0.75CNF) treatment. However, the drying rate of fabrics modified with CNFs was found to be lower than that of untreated cotton fabrics as remained water ratio of the cotton fabrics were maintained at ~58% while 0.75CNF system showed only 67%. This property can be improved by using different strategies in future research.

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