Superhydrophobic modification of normally hydrophilic cotton fabrics

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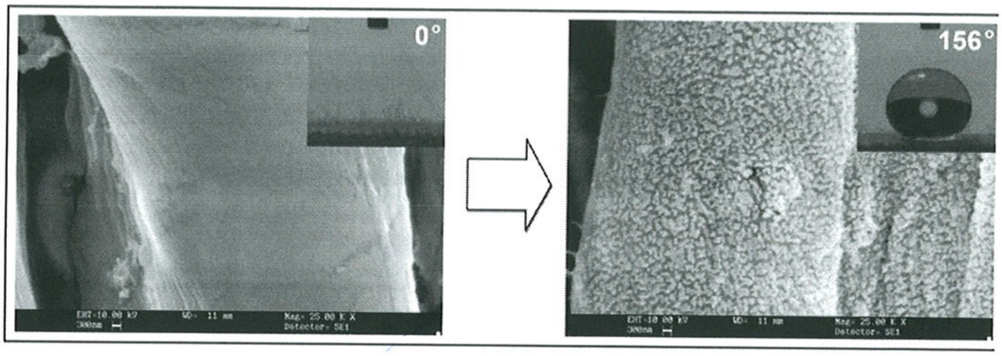
Cotton is an abundant, inexpensive and biodegradable raw material for textile and clothing products, but is also water-absorbing and easily stained due to surface hydroxyl groups. In nature, the unusual superhydrophobicity of lotus leaves with water contact angles larger than 150 °C is known to originate from micro- and nanoscale structures and low surface energy materials. Inspired by this, normally hydrophilic cotton fabrics were transformed into superhydrophobic surfaces via the controlled electrostati assembly of silica nanoparticles followed with fluoroalkylsilane (FAS) treatment. In brief, negatively charged cotton fabrics were produced by grafting of poly(acrylic acid) (PAA) via esterification reaction between carboxyl groups of PAA and hydroxyl groups on the fibre surface. The charged fabrics were the used as substrates for layer-by-layer electrostatic assembly of negative silica nanoparticles and positive poly(allylamine hydrochloride) (PAH). The surface morphology of the resulting coatings can be easily tailored by controlling the number of assembly cycles. Further modification with FAS led to the generatio of superhydrophobic surface with both advancing and receding contact angles larger than 150°C, which practically nonwettable and self-cleaning.



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Research Activities:
Developing functional polymer-based interface materials via surface chemistry and micro-/nano-structures; Effects of surface chemistry and topography on surface wetting properties; Various applications of coatings with special wetting and self-cleaning properties