

Modulation of Surface Wetting Phenomena on Fibrous Materials Using Atomic Layer Deposition

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Abstract: Natural and synthetic fibrous materials are finding a wide range of new applications including advanced filtration, composite reinforcement, functional membranes for protection and biological species capture, and substrates for printed and flexible energy conversion devices and sensors. The ability to adjust and control surface energy, surface reactivity and wettability of fiber materials will enable new functionality, by controlling how the large surface area of the fiber structure responds to interacting chemical species. Atomic layer deposition (ALD) is a vapor phase chemical process that produces thin inorganic and electronically active films to be coated on a range of material substrates with highly conformal monolayer-scale precision. Our group has recently explored ALD onto polymeric and naturally occurring fiber materials, to understand how surface modification influences surface wetting and reactivity. This presentation will provide an introduction to the physics of surface wetting phenomena and thin film material deposition, then discuss particular results on wetting transitions in ALD-coated fiber systems. Possible applications and ramifications of these results in terms of separations and photochemical reaction enhancement will also be presented.