

Tuning Hydrophobicity of TiO₂ Layers with Silanization and Self-assembled Nanopatterning

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The wettability of TiO₂ layers is controlled by forming highly ordered arrays of nanocones using nanopatterning, based on self-assembly and dry etching. Nanopatterning of TiO₂ layers is achieved via formation of self-assembled monolayers of SiO₂ spheres fabricated using the Langmuir-Blodgett technique, followed by dry etching. Compared to a thin film TiO₂ layer, the nanopatterned TiO₂ samples show a smaller static water contact angle, where the water contact angle decreases as the etching time increases, which is attributed to the Wenzel equation. When TiO₂ layers are coated by 1H,1H,2H,2H-perfluorooctyltrichlorosilane, we observed the opposite behavior, exhibiting superhydrophobicity (up to contact angle of 155°) on the nanopatterned TiO₂ layers. Self-assembled nanopatterning of the TiO₂ layer may provide an advanced method for producing multifunctional transparent layers with self-cleaning properties.

Keywords: Wettability, TiO₂ layers, Langmuir-Blodgett technique, Hydrophilicity