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Transparent and Superhydrophobic Films Prepared by Polydimethylsiloxane-Coated Silica nanoparticles

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We report a simple and cost-effective method to fabricate transparent superhydrophobic surface on various substrates. The surface was fabricated by coating hydrophobic PDMS (polydimethylsiloxane) film on the silica nanoparticle and subsequent fixing of the hydrophobic silica nanoparticles onto substrates. The water contact angle for the prepared surface was determined to be over 150°, which indicates that the surface is highly repellent to water. The hierarchical structure and roughness of the surface were examined by scanning electron microscopy (SEM) and atomic force microscopy (AFM). Additionally, transparency of the prepared surface was measured with UV-VIS spectrometer. The transmittance of the superhydrophobic surface was ~80%, which is lower than that without PDMS-coated silica by only 5 to 10%. It is also notable that the superhydrophobic surface fully recovers its original transmittance after self-cleaning process. Also the PDMS coating is stable under a wide range of pH conditions, UV radiation and salinity conditions, which is essential for the practical use. Moreover, our fabrication method is applicable in large scale production.

Keywords: Superhydrophobicity, Transparency, PDMS (Polydimethylsiloxane) coating, Silica nanoparticles, Self-cleaning effect