Preparation of Transparent Superhydrophobic Surface

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In the present study, transparent superhydrophobic films on glass substrates have been extensively investigated using a simple dip coating method at room temperature. The main objective of the present study is to fabricate a transparent superhydrophobic glass surface using a surface etching method and further modification was carried out to achieve best outcomes that is required to overcome the major drawbacks of existing superhydrophobic films. The substrates were prepared by using two different chemical etchants such as Sodium hydroxide (NaOH) and Hydrogen fluoride (HF) under different deposition time. Besides, Titanium(IV) isopropoxide ($Ti\{OCH(CH_3)_2\}_4$) was used as a precursor to fabricate a hydrophobic film on the substrate. The hydrophobicity of deposited coatings is improved by derivatization of coatings with Hexadecyltrimethoxysilane (HDTMS) as a silylating agent in ethanol for 24 h. The coated surfaces were characterized by static water contact angle (CA), water tilting angle (TA), Ultraviolet-Visible spectroscopy (UV-Vis) and Scanning Electron microscopy (SEM). The enhancement of wetting behaviour is obtained by the sandpapered substrate that is accounted for maximum static water contact angle of 112.49° under 15 min deposition time in 5 mol L^{-1} NaOH and 24 hrs deposition time in HDTMS. It is also evident that the minimum dynamic water tilting angle is around 10.9 for the substrate dipped in 1 mol L^{-1} NaOH for 1hr and HDTMS for 24 hrs. Results indicate that the most of the coated surfaces attained optical transmittance above 75% in the visible region (378 nm) of the resulted spectrum. It is also evident that the transparent superhydrophobic coatings can be achieve excellent behavior properties with good optical transmission by controlling the surface roughness of the resultant coatings.

Keywords: Transparent, Superhydrophobic, Hexadecyltrimethoxysilane, Etching, Roughness