

ABSTRACT

Superhydrophobic ZnO/SiO₂ coatings with an excellent water contact angle and self-cleaning performance were successfully fabricated using a sol-gel dip coating method. These superhydrophobic coatings were deposited onto glass slides and cotton fabrics. In contrast to the prior studies that used polymer matrixes with naturally hydrophobic performance, this research was simply utilize hydrophobic chains from ethanol. This studies exhibit that obtaining a superhydrophobic surface does not precisely require polymer matrix. Surface hydrophobicity was primarily governed by hierarchical structures formed by ZnO seed layer and ZnO/SiO₂ materials. SEM images revealed the surface morphology and hierarchical structure of the surfaces. A homogeneous hierarchical structure increased the water contact angle of cotton fabric from 0° to 151.967° after ZnO seeding, and 162.81° after ZnO/SiO₂ modification. The results explained the ZnO/SiO₂ superhydrophobic surface supports the Cassie-Baxter model; a wettability model that describes hydrophobicity due to the surface roughness. XRD confirmed certain aspects of the ZnO crystal structure, including crystallite size and lattice distance (d-spacing). The presence of a hydrophobic chain was confirmed through the FTIR, which demonstrates how chemical binding affects wettability. The water repellency of ZnO/SiO₂ superhydrophobic coatings has lasted up to 10 seconds in methylene blue solution. Moreover, the superhydrophobic coating exhibit an exceptional self-cleaning performance against a variety of pollutants.

Keywords: *superhydrophobic coating, hierarchical structure, ZnO/SiO₂, self-cleaning, sol-gel.*