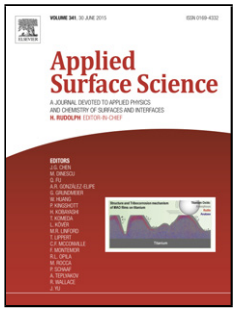

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Preparation of hierarchical porous Zn-salt particles and their superhydrophobic performance

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Abstract

Superhydrophobic surfaces arranged by hierarchical porous particles were prepared using modified hydrothermal routes under the effect of sodium citrate. Two particle samples were generated in the medium of hexamethylenetetramine (P1) and urea (P2), respectively. X-ray diffraction, scanning electron microscope, and transmission electron microscope were adopted for the investigation, and results revealed that the P1 and P2 particles are porous microspheres with crosslinked extremely thin (10 nm to 30 nm) sheet crystals composed of $Zn_5(OH)_8Ac_2 \cdot 2H_2O$ and $Zn_5(CO_3)_2(OH)_6$, respectively. The prepared particles were treated with a fluoroethylene vinyl ether derivative and studied using Fourier transform infrared spectroscopy and energy-dispersive X-ray spectrometer. Results showed that the hierarchical surfaces of these particles were combined with low-wettable fluorocarbon layers. Moreover, the fabricated surface composed of the prepared hierarchical particles displayed considerably high contact angles, indicating great superhydrophobicity for the products. The wetting behavior of the particles was analyzed with a theoretical wetting model in comparison with that of chestnut-like ZnO products obtained through a conventional hydrothermal route. Correspondingly, this study provided evidence that high roughness surface plays a great role in superhydrophobic behavior.

Key Words

Superhydrophobic material, Hydrothermal process, Hierarchical structure, Surface