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Self-assembly of stearic acid into nano flowers induces the tunable surface wettability of polyimide film

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Abstract

Polyimide (PI) films with special wettability have received great attention for their potential applications. However, it is still a challenge to fabricate PI film with tunable wettability from hydrophobic to superhydrophobic and tensile strength > 140 MPa. Herein, PI films with tunable surface wettability induced by the nano flowers of SA through the self-assembly. Flower-like ZnO was grown on PI film without seed layer or morphology controlling agents via a simple hydrothermal method, which promoted to the self-assembly of SA into nano-flowers. Morphologies of ZnO crystals change from open-flower to sphere-bud just by tuning the synthetic concentration of zinc solution. SA can assemble into nano flower-like structures on all ZnO modified films resulting in water contact angles changing from 124.0° to 155.5° . The self-assembly mechanism was also investigated. The superhydrophobic PI exhibits stable superhydrophobicity under dynamic water pressure, which is a crucial parameter for potential self-cleaning employment. Thermal stability of superhydrophobic film are comparable to the pristine PI film. Tensile strength of superhydrophobic PI film is higher than 140 MPa.

Key Words: self-assembly; wettability; nano flower; polyimide; hydrothermal

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