

Optimization of hydrophobicity and mechanical robustness in SiO₂/epoxy films

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Self-cleaning technology has been applied in a wide range of fields such as solar panels, glass windows, and smart devices. Superhydrophobic property (water contact angle more than 150°) has commonly been achieved by coexisting low surface energy and high surface roughness. However, the coating films have been vulnerable to external stress and have shown low transparency.

In this paper, we have used epoxy in superhydrophobic silica coating films to fabricate robust and transparent coating films. Epoxy can increase mechanical hardness significantly, but its low contact angle (about 60°) can deteriorate the superhydrophobicity of the coating films. To optimize between superhydrophobic and mechanical properties, hydrophobic silica nanoparticles to epoxy weight ratio was adjusted before coating. In addition, transparency of the coating films was obtained by controlling rotation speeds in a spin-coating process.