A mechanically robust superhydrophobic coating with spray-coated epoxy silicone polymer/SiO_2 composites

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Abstract The development of biomimetic superhydrophobic surfaces (SHS) inspired by nature is a key area in advanced materials science. SHS can effectively prevent the ingress of moisture and is thus applicable for corrosion prevention. SHS prevents metal corrosion by forming an air layer at the metal/coating interface. Poor robustness and complex manufacturing processes are the main obstacles to the application of superhydrophobic coatings for corrosion protection. Here, we use PDMS and epoxy resin as the matrix materials and fabricate a superhydrophobic functional coating embedded with fluorinated silica particles through simple spraying and room-temperature curing. The surface prepared by modifying SiO_2 nanoparticles with 1H, 2H, 2H-perfluorodecyl- triethoxysilane (PFDTES) as the functional filler exhibits excellent superhydrophobic, with a water contact angle (WCA) of 160 ± 1.5°. Inorganic particles and organic resins jointly form a unique double-layer structure. The surface protrusions and porous structure work together to enhance the durability of the superhydrophobic coating, and the porous structure can capture more air to form an air layer.

Keywords：Superhydrophobic; Multi-layer coating; Anti-corrosion; Robust