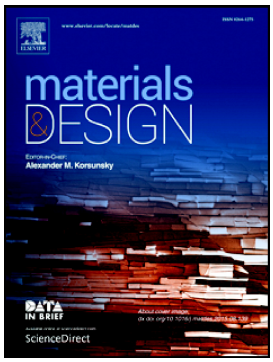

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A strategy for constructing superhydrophobic multilayer coatings with self-cleaning properties and mechanical durability based on the anchoring effect of organopolysilazane

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ABSTRACT

Artificial superhydrophobic surfaces suffer from poor mechanical durability. Organopolysilazane (OPSZ), which could anchor to most materials, and fluorinated silica nanoparticles (F-SiO_2 NPs) were employed to construct mechanically durable superhydrophobic nanocomposite multilayer coatings. $(OPSZ/F\text{-}SiO_2)_n$ (n = 0.5, 1, 1.5, …, 5) coatings were constructed by alternately spraying OPSZ and F-SiO_2 NPs layer by layer on glass substrates. With the increase in the number of OPSZ/F-SiO_2 bilayers, the surface roughness and hydrophobicity exhibited an overall increasing trend. The coatings with F-SiO_2 NPs on the outside possessed slightly rougher surfaces and stronger hydrophobicity than the corresponding coatings with OPSZ on the outside. The coating containing five bilayers exhibited a microscopic rough surface with hierarchical micro/nanoscale structures and superhydrophobicity, with a water contact angle of 158.3° and a sliding angle of 3°. The coating was translucent and possessed a low water droplet adhesive force (13 μN) and good self-cleaning properties. It possesses excellent mechanical durability and maintains its superhydrophobicity upon being immersed in strong acid and alkali solutions, presenting broad application prospects. This facile yet universal strategy for constructing superhydrophobic coatings offers an effective solution to the poor mechanical durability