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Mechanical durability enhanced self-cleaning composite material with superhydrophobic and photocatalytic ability

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Self-cleaning materials inspired and derived from natural materails like lotus leaf and butterfly wings, have gained significant scientific and commercial interests in the past few decades, since they are energy/labour-saving and environmentally friendly. Several technologies have been developed to obtain self-cleaning materials. Among them, the combination of superhydrophobic and photocatalytic properties enable an efficient removal of solid particles and organic contaminations. However, the fragility of the nanoscale roughness from the superhydrophobic surface limited the practical applications. Hierarchical structure combining micro/nanoscale architecture was created to protect the nanoscale surface roughness from mechanical damage. 75 μm glass beads(GBs) were embedded into a low density polyethylene(LDPE) matrix by heating up to the glass transition temperature. Silicone nanofilaments (SNFs) layer was coated via droplet assisted growth and shaping (DAGS) approach, providing the surface roughness as well as the support base for photocatalysts due to the enlarged surface area. TiO2 nanoparticles (NPs), which served as photocatalyst, were synthesized through a hydrothermal reaction. The self-cleaning effect was proved by the great non-wettability for various liquids, degradation of organic contamination under UV light and antibacterial test. It was confirmed with the enhanced mechanical durability in abrasion test.

Biography

Xiaotian Zhang has completed his Master Degree at the National University of Singapore and Technical University of Munich in 2014. He joined Professor Stefan Seeger's group at the University of Zurich in 2015 and is continuing his PhD study in the field of silicone nanofilaments (SNFs). His work mainly focuses on the superhydrophobic and photocatalytic applications of SNFs composite material.

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