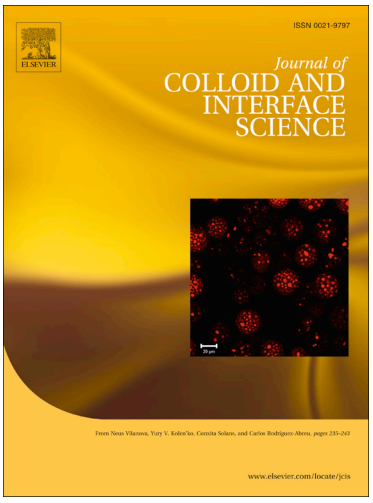

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Environmentally durable superhydrophobic surfaces with robust photocatalytic self-cleaning and self-healing properties prepared via versatile film deposition methods

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Abstract

Superhydrophobic (SH) surfaces with self-cleaning photocatalytic properties have become an important research focus in recent years. In this work, we fabricated multifunctional and environmentally durable SH surfaces via a facile one-step reaction of octadecyl isocyanate (ODI) with TiO_2 particles. The resulting films possess SH properties, facilitated by a combination of hydrophobic long alkyl chains and the hierarchical crystalline structure. Films can be prepared via spray or blade coating on a variety of hard and soft substrates, and function well when exposed to either air or oil. The coating retains its SH properties for at least 6 months in ambient conditions, and after organic pollution it can recover its SH properties using UV or sun light illumination. After water impalement, the SH properties can self-heal via the self-assembly of long alkyl chains to their original state within several hours at ambient conditions, or within minutes on a heating stage. The covalent bonds between alkyl chains and TiO_2, together with hydrogen bonds between adjacent alkyl chains, greatly increased the surface durability of the SH films. This multifunctional SH coating is a very promising material for commercial and industrial coating applications.