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Novel transparent, liquid-repellent smooth surfaces with mechanical durability

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Abstract

A simple fabrication method for a smooth and transparent liquid-repellent film has been presented, and the smooth film was successfully obtained through sol-gel process with (3-Glycidyloxypropyl)-trimethoxysilane (GPTMS) followed by surface treatment of air plasma and fluorination. Combination of hydrolyzing of GPTMS and the surface treatment can form covalently interfacial interaction and further enhance surface robustness of the smooth film. The smooth film displays non-wetting behavior towards water and many organic liquids with very low surface tension, such as N-hexane (γ_{lv}=18.4 mN/m) and Petroleum ether (γ_{lv}=17.5 mN/m); meanwhile, optical transmittance of the smooth film is greater than 86% throughout a broad spectrum of ultraviolet and visible wavelengths. Importantly, mechanical durability of the obtained film surface was proved by tests of rubbing, wiping, thumb pressing, and peeling of adhesive tape. More surprisingly, the rubbing process can enhance surface

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