

Accepted Manuscript

Full Length Article

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PII: S0169-4332(18)30019-9
DOI: <https://doi.org/10.1016/j.apsusc.2018.01.017>
Reference: APSUSC 38156

To appear in: *Applied Surface Science*

Received Date: 23 October 2017
Revised Date: 18 December 2017
Accepted Date: 3 January 2018

Please cite this article as: G. Yang, J. Song, X. Hou, Fabrication of highly hydrophobic two-component thermosetting polyurethane surfaces with silica nanoparticles, *Applied Surface Science* (2018), doi: <https://doi.org/10.1016/j.apsusc.2018.01.017>

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Fabrication of highly hydrophobic two-component thermosetting polyurethane surfaces with silica nanoparticles

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Abstract

Highly hydrophobic thermosetting polyurethane (TSU) surfaces with micro-nano hierarchical structures were developed by a simple process combined with sandpaper templates and nano-silica embellishment. Sandpapers with grit sizes varying from 240 to 7000 grit were used to obtain micro-scale roughness on an intrinsic hydrophilic TSU surface. The surface wettability was investigated by contact angle measurement. It was found that the largest contact angle of the TSU surface without nanoparticles at $102 \pm 3^\circ$ was obtained when the template was 240-grit sandpaper and the molding process started after 45 min curing of TSU. Silica nanoparticles modified with polydimethylsiloxane were scattered onto the surfaces of both the polymer and the template to construct the desirable nanostructures. The influences of the morphology, surface composition and the silica content on the TSU surface wettability were studied by scanning electron microscopy (SEM), attenuated total reflection (ATR) infrared (IR) spectroscopy, X-ray photoelectron spectroscopy (XPS) and contact angle measurements. The surface of the TSU/SiO₂ nanocomposites

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