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AN ELECTROSPRAY-BASED FABRICATION OF SILICA AEROGEL EMBEDDED POLYURETHANE ULTRAHYDROPHOBIC SURFACE

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Superhydophobic surfaces with water contact angles (WCA) greater than 150° have gained much attention of researchers due to their interesting properties, such as self-cleaning, anti-corrosive, oil-water separation, and especially, extreme water repellency. Superhydrophobicity can be achieved by fabricating nano/micro structures on a surface with the appropriate roughness and low surface free energy in order to trap air between the material surface and water droplets. In this work, such surface has been fabricated for the first time with a single-step electrospraying process using polyurethane (PU) added with silica aerogel (Si). The water contact angle along with surface morphology was studied by varying electrospraying parameters, such as relative contents of PU and aerogel, needle size, and electrospraying time. The morphology of the modified surface was analyzed using scanning electron microscopy. Elemental mapping of the surfaces was performed using energy-dispersive X-ray spectroscopy. It was observed that the addition of the aerogel to the PU electrospraying mixture resulted in morphological changes on the surface introducing a surface roughness, which in turn increased the WCA of the surface from 143° to 154°, which is indicative of ultrahydrophobicity. Enhanced thermal insulation was also observed with the PU+Si surface when it was assessed against the same fabric electrosprayed with only PU. This could be attributed to the thermal insulation property of Si aerogels. In this facile method, polyurethane in combination with silica aerogel introduces appropriate surface roughness and low surface free energy to gain increased hydrophobicity.

Keywords: Electrospray, Polyurethane, Silica aerogel, Ultrahydrophobic