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Superamphiphobic nanocellulose aerogels loaded with silica nanoparticles

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摘要	Superamphiphobic aerogels of cellulose nanofibrils (CNF) were successfully fabricated based on their porous rough structure via the chemical vapor deposition of fluorosilane reagent. FE-SEM images show the protruding nano-filaments, micron fibrils and sheet-like layers in the nanocellulose aerogel constitute the micro-nano hierarchical structure, which is critically important for the superamphiphobic performance. The lyophobicity increases with an increase in the nanocellulose concentration within the range of 0.5-2.0 wt%. For the fluorinated aerogel with CNF concentration of 2.0 wt%, the contact angles of water, castor oil, and hexdecane reach 163 degrees, 154 degrees and 143 degrees, respectively. In addition, the loading of SiO2 nanoparticles in the CNF aerogels was conducted to increase the proportion of the nanoscale protuberance on the aerogel surface. The combination of nanocellulose and the loaded SiO2 nanoparticles optimizes the micro-nano hierarchical structure, which further improves the superamphiphobic performance with the contact angle of hexdecane reaching 150 degrees. The superamphiphobic CNF-based composite aerogels with excellent liquid repellency for both water and oil can be used as potential self-cleaning substrates in the fields of gas sensors, catalysis, supercapacitor, and etc.
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