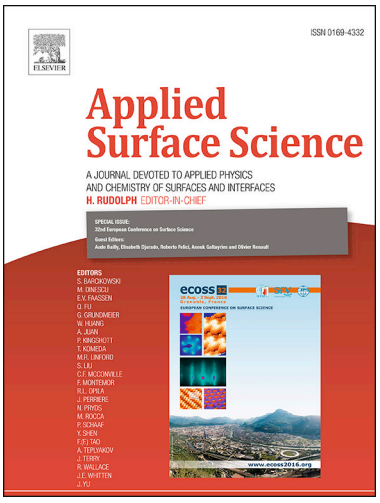

Full Length Article

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Fabrication of underwater superoleophobic metallic fiber felts for oil–water separation

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Abstract:

Hierarchical nanoneedles-like $Cu(OH)_2$ structure coated stainless steel fiber felts (SSFF) with underwater superoleophobic (154° ± 2.2°, n-octane, oil contact angle) and low-adhesive properties have been successfully fabricated via simple nanoparticles deposition and electrochemical oxidation methods. Meanwhile, when a water droplet (5 μL) contacted the SSFF/Au/Cu/$Cu(OH)_2$ surface, it spread out quickly and reached a 0° CA with very short time, suggesting a superior superhydrophilic property. The SSFF/Au/Cu/$Cu(OH)_2$ was used to separate oil-water mixtures, oil-corrosive salt solution mixtures and oil-in-water emulsions with high efficiency, which allowed water to permeate through while retained oil. In addition, the SSFF/Au/Cu/$Cu(OH)_2$ still maintained high separation efficiency above 99% after 5 emulsion recycling separation times.

Keyword: metal fiber felts; gold nanoparticles; $Cu(OH)_2$ nanoneedles; underwater superoleophobic; oil- water separation

1. Introduction

Owing to the oil spill accidents and the increasing industrial wastewater, causing a series of ecological and environmental disasters, oily wastewater treatment has attracted intensive attention recently[1]. In particular, emulsified oil-water mixtures with insoluble droplets in the micron size range[2], such as oilfield produced water and cutting wastewater containing oil, was very difficult to purify. In recent years, researchers have employed many superwetting[3] materials with small pore size for effective oil-water emulsion separation[4]. Superwetting materials included