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Fabrication of a superhydrophobic and superoleophilic teflon surfaces using infrared laser irradiation

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Separating the mixture of water and oil by the superhydrophobic/superoleophilic materials has attracted increasing research and practical interests [1]. Various technologies have been developed to fabricate such materials. The femtosecond laser microfabrication becomes one of the wide used techniques because of its negligible heat-affected zone, precise ablation threshold and high spatial resolution [2].

In this work, the surface microstructuring of teflon (polytetrafluoroethylene, PTFE) substrates was done by IR laser ablation. The 2-mm-thick plates of PTFE were treated by means of CO_2 gas laser based on VLS-300/40 pulsed laser system, Universal Laser Systems, US. The obtained surface microstructures were imaged by means of scanning electron microscope Merlin, Carl Zeiss, Germany.

The treated surfaces showed both strong superhydrophobicity (low water adhesion) and ultrahigh superoleophobicity (high oil adhesion). Contact angles for water droplet on the surface before treatment was 101 degrees and on surface just after treatment with optimal parameters it increased up to 140 degrees. Analysis of the treated surfaces allowed to reveal the complicated surface structures containing several spatial scales.

The microstructured PTFE substrates were perforated by reach-through micro-holes with diameters ranged from 0.2 to 1 mm made by IR laser drilling. The produced perforated and treated plates demonstrated highly efficient oil/water separation due to their superhydrophobicity and superoleophilicity. The proposed technique exhibits the strong potential for practical application.

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1. J. Yong et al., *Phys. Chem. Chem. Phys.*, **20**, 25140 (2018).
2. J. Yong et al., *Adv. Mater. Interfaces*, **5**, 1701370 (2018).