www.elsevier.com/locate/memsci

Solvent-Thermal Induced Roughening: a Novel and Versatile Method to Prepare Superhydrophobic Membranes

Weihua Qing, Xiaonan Shi, Weidong Zhang, Jianqiang Wang, Yifan Wu, Peng Wang, Chuyang Y. Tang

PII: S0376-7388(18)30814-7
DOI: https://doi.org/10.1016/j.memsci.2018.07.035
Reference: MEMSCI16314

To appear in: *Journal of Membrane Science*

Received date: 25 March 2018
Revised date: 10 July 2018
Accepted date: 14 July 2018

Cite this article as: Weihua Qing, Xiaonan Shi, Weidong Zhang, Jianqiang Wang, Yifan Wu, Peng Wang and Chuyang Y. Tang, Solvent-Thermal Induced Roughening: a Novel and Versatile Method to Prepare Superhydrophobic Membranes, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.07.035

Solvent-Thermal Induced Roughening: a Novel and Versatile Method to Prepare Superhydrophobic Membranes

Weihua Qing [a], *Xiaonan Shi* [a], *Weidong Zhang* [b], *Jianqiang Wang* [a], *Yifan Wu* [a], *Peng Wang* [c], *Chuyang Y. Tang*[a*]

[a] Department of Civil Engineering, The University of Hong Kong, Pokfulam, Hong Kong 999077

[b.] State Key Laboratory of Chemical Resource Engineering, Beijing Key Laboratory of Membrane Science and Technology, Beijing University of Chemical Technology, Beijing 100029, People's Republic of China

[c.] Water Desalination and Reuse Center, Division of Biological and Environmental Sciences and Engineering, King Abdullah University of Science and Technology, Thuwal 23955-6900, Saudi Arabia

Abstract:

Surface roughness enhancement by fabricating multi-scale nano/microstructure is an effective strategy to prepare superhydrophobic membranes. Here we report a novel solvent-thermal induced roughening (STIR) method. The method involves the swelling of a polymer surface to create a soft shell/hard core structure under the combined action of solvent and heating, followed by a controllable surface roughening as a result of mismatched thermal expansion between the shell and the core. We show a significant increase of surface roughness for a STIR-treated polyvinylidene fluoride nanofibrous membrane, whose nanofibers were covered with densely-packed nanofins. The treated membrane had greatly enhanced hydrophobicity, resulting in improved anti-wetting performance to low-surface-tension feed water in a membrane distillation process. The STIR method was capable of treating membranes with various pore structures. The novel surface roughening strategy opens up new directions to fabricate superhydrophobic surfaces and membranes, which can greatly benefit a wide range of applications such as membrane distillation, oil/water separation.