Author's Accepted Manuscript

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PII: S0376-7388(18)31894-5
DOI: https://doi.org/10.1016/j.memsci.2018.09.064
Reference: MEMSCI16509

To appear in: *Journal of Membrane Science*

Received date: 11 July 2018
Revised date: 25 September 2018
Accepted date: 27 September 2018

Cite this article as: Wanyi Fu and Wen Zhang, Microwave-enhanced Membrane Filtration for Water Treatment, *Journal of Membrane Science,* https://doi.org/10.1016/j.memsci.2018.09.064

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Abstract

Sustaining high flux (permeability) and diversified pollutant rejection (selectivity) are two crucial benchmarks for membrane filtration processes. Here, we report a microwave-enhanced membrane filtration process that uses microwave (MW) irradiated and catalyst-coated ceramic membranes to achieve efficient removal of pollutants (*i.e.*, 1,4-dioxane) and significant mitigation of fouling. MW irradiation was selectively absorbed by catalysts and hydrogen peroxide to produce ‘‘hotpots” on membrane surface that promoted generation of radicals and nanobubbles. These active species enhanced pollutant degradation and further prevented membrane fouling. In contrast to ultrasound and ultraviolet radiations, MW could efficiently penetrate membrane housing materials and selectively dissipate energy to membrane-impregnated catalyst nanoparticles. Our study of MW-assisted membrane filtration processes may open new avenues toward next-generation antifouling and high-efficiency separation techniques.