



IMMOBILIZATION OF TiO_2 AND TiO_2/CNT NANOPARTICLES USING POLYDOPAMINE TO FABRICATE PHOTOCATALYTICALLY ACTIVE PVDF MEMBRANES FOR FILTRATION OF OIL EMULSIONS

Ákos Ferenc Fazekas, Zsuzsanna László, Gábor Veréb

Department of Biosystem Engineering, Faculty of Engineering, University of Szeged, Moszkvai Blvd.
9, H-6725 Szeged, Hungary
e-mail: fazekas@mk.u-szeged.hu

ABSTRACT

Membrane filtration is a potential method for purification of oily wastewater. It is chemical-free, easy to incorporate with other techniques, and simple to operate. Moreover, it is effective for removing micro- and nanosized oil droplets. In this study, we aimed to develop PVDF membrane surfaces with photocatalytic properties and favorable filtration properties via polydopamine based immobilization of photocatalytic nanomaterials. The efficiency of TiO_2 and TiO_2/CNT in the photocatalytic degradation of methyl orange dye was evaluated, and the several filtration parameters (fluxes, filtration resistances, flux recovery ratios, purification efficiencies) were examined for the treatment of oil-containing wastewater. Modifying the membranes with nanoparticles led to a substantial improvement in the flux recovery factor, resulting in a flux reduction rate of 79-83%. Additionally, the irreversible resistance decreased by approximately 60% for membranes coated with polydopamine and by approximately 70% for those containing nanoparticles compared to the unmodified membranes. In terms of photocatalytic measurements, the best photocatalytic degradation result (approximately 20%) for pure TiO_2 modified membranes was obtained.

Keywords: PVDF, membrane filtration, oil emulsion, TiO_2 , CNT

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