



Nanofiltration membranes enhanced with TiO₂ nanoparticles: a comprehensive study

Arcadio Sotto^{a,b,*}, Arman Boromand^b, Stefan Balta^{b,c}, Siavash Darvishmanash^b,
Jeonghwan Kim^d, Bart Van der Bruggen^b

^aDepartment of Chemical and Energetic Technology, University Rey Juan Carlos, Tulipán s/n, 28933-Móstoles, Madrid, Spain
Tel. +34-91-4888153; Fax: +34-91-4887068; email: arcadio.sotto@urjc.es

^bK.U. Leuven, Laboratory for Applied Physical Chemistry and Environmental Technology, Department of Chemical Engineering,
W. de Croylaan 46, B-3001 Leuven, Belgium

^cDepartment of Environmental and Material Engineering, University Dunarea de Jos, Domneasca, Galati, Romania

^dDepartment of Environmental Engineering, INHA University, Nam-gu, Yonghyun-dong 253, Incheon, Republic of Korea 402-751

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ABSTRACT

TiO₂ nanoparticles are of potential interest for nanofiltration membranes in view of flux increase and improved fouling resistance. Conclusions from published studies, however, cannot be translated to other applications because results depend on specific parameters of which the precise effect is still unknown. In this study, PES flat-sheet membranes were manufactured for wastewater treatment application. The effects of TiO₂ nanoparticles as additive on the preparation of polyethersulfone (PES) blend nanofiltration membranes were investigated in terms of pure water flux, hydraulic membrane resistance (permeability) and solute rejection performance. A polyethersulfone (PES) membrane was modified by dispersing nanoparticles of titanium oxide (TiO₂) in a PES solution. The membranes were prepared with 30 wt.% of polymer PES by phase inversion method. 1-Methyl-2-pyrrolidone and deionized water were employed as solvent and coagulant, respectively. Membrane fouling was explored with humic acids as a model organic foulant. Overall, the permeability was higher for blended membrane while the rejection was almost similar for both types of membranes using a model dye as a reference. Moreover, fouling was more pronounced for the neat PES membranes as compared to the TiO₂ blended membrane. In addition the membranes were characterized using SEM and contact angle measurements.

Keywords: Nanofiltration; Membrane fouling; PES; TiO₂; Nanoparticles

*Corresponding author.