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Ultrafiltration fouling trend simulation of a municipal wastewater treatment plant effluent with model wastewater

M. Torà-Grau*, J.L. Soler-Cabezas, M.C. Vincent-Vela, J.A. Mendoza-Roca, F.J. Martínez-Francisco

Instituto de Seguridad Industrial, Radiofísica y Medio Ambiental, Universitat Politècnica de València, Camino de Vera s/n, 46022 Valencia, Spain, Tel. +34 96 387 70 00, ext. 76380; Fax: +34 96 387 76 39; emails: mitogr@etsii.upv.es (M. Torà-Grau), jsoca@isirym.upv.es (J.L. Soler-Cabezas), mavinve@iqn.upv.es (M.C. Vincent-Vela), jamendoz@iqn.upv.es (J.A. Mendoza-Roca), framarfr@iqn.upv.es (F.J. Martínez-Francisco)

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ABSTRACT

Secondary treatment effluents (STEs) from municipal wastewater treatment plants (MWTPs) require tertiary treatments to be reused in agriculture. Among tertiary treatment technologies, ultrafiltration (UF) has been proven to be a reliable reclamation process. Nevertheless, this technique has an important disadvantage: Membrane fouling. This phenomenon causes decline in permeate flux with time and increases the operational costs. Due to the fact that secondary effluents from MWTPs contain a large amount of different compounds and that there is certain variability in their composition, the use of a simplified model wastewater consisting of only few compounds may help to simulate better the UF fouling trend. The main STE components responsible for fouling membrane during UF tests are extracellular polymeric substances (EPS). These substances are mainly composed of proteins and polysaccharides; thus, they are commonly used to prepare model wastewaters. This work consisted in two parts. Firstly, a model wastewater was selected, attending to protein and carbohydrate content and chemical oxygen demand (COD), among different model solutions mimicking STE. Secondly, UF behavior of the selected model solution was compared with the behavior of the secondary effluent in the UF tests at different cross-flow velocities (0.8–1.2 m/s) and transmembrane pressures (TMPs) (62–100 kPa). The membrane used in the UF tests was UFCM5 Norit X-flow® hollow-fiber (HB). The model wastewater that represented the best the fouling trend of the STE had a composition of 15 mg/l of bovine serum albumin (BSA) and 5.5 mg/l of dextran. It was found that BSA contributed to long-term fouling, whereas dextran contributed to both long- and short-term fouling.

Keywords: Ultrafiltration; Model wastewater; Municipal treatment plant; Fouling

*Corresponding author.

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