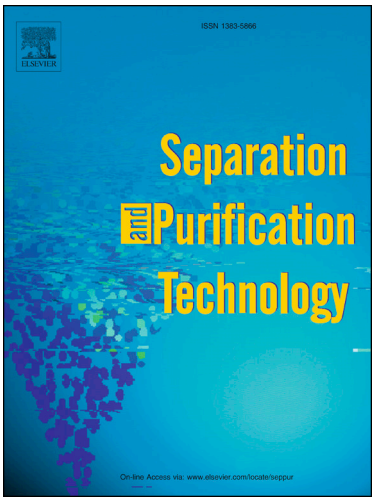

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BOUNDARY FLUX MODELLING FOR PURIFICATION OPTIMIZATION OF DIFFERENTLY-PRETREATED AGRO-INDUSTRIAL WASTEWATER WITH NANOFILTRATION

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Highlights

Operation design of membrane treatment plants for olive mill wastewater was examined. > Boundary flux theory was used to set-up and control the operation of a NF membrane. > Operation of NF membrane upon boundary conditions ensured high flux (68.2 L $h^{-1}m^{-2}$). > Membrane fouling build-up was also minimized in all cases (0.02-0.08 L $h^{-2}m^{-2}bar^{-1}$). > Feasible and sustainable compliance of the irrigation standards were achieved.

Abstract

The design and operation of membrane purification plants implies the prediction and control of dynamic fouling phenomena as a key to succeed. In this research article, the boundary flux theory was used to set-up and control the operating framework and model the performance of a NF membrane operation, for the purification of olive mill wastewater (OMW) previously conducted to different pretreatments. Olive oil is produced by means of a technological process which avoids the use any chemicals. In this line, this industry is concerned to make the whole process environmentally friendly, and this comprises the treatment of the wastewater generated. The operation of the NF membrane unit upon the boundary flux conditions ensured high steady-state permeate productivity (50.1 - 68.2 L $h^{-1}m^{-2}$) while at the same time could minimize the fouling build-up on the membrane for every feedstock (0.02 - 0.08 L $h^{-2}m^{-2}bar^{-1}$). This can help make the process economically sustainable, providing high feed recovery and significant organic pollutants rejection efficiencies. The latter would permit the compliance of the standard limits to reutilize all treated effluent streams for irrigation