

Membrane hybrid processes for pretreatment before seawater reverse osmosis desalination

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ABSTRACT

The objective of this work is to study at lab-scale the efficiency of a hybrid process coupling ultrafiltration (UF) and adsorption as a pretreatment before seawater reverse osmosis desalination (SWRO). Powdered activated carbon (PAC) and bentonite were used as adsorbents. Actual seawater from Mediterranean Sea was filtered by regenerated cellulose membrane of molecular weight cut-off 30 kDa. The PAC addition allows a decrease of UF fouling rate and an increase of the natural organic matter (NOM) removal, especially for a PAC concentration of 200 mg L⁻¹. An increase of contact time between PAC and seawater induces a reduction of fouling rate. When the contact time increases, the contribution to NOM removal due to PAC adsorption becomes more significant compared to that due to UF alone. Concerning studies with bentonite, the UF fouling rate depends on the bentonite concentration. Addition of more than 500 mg L⁻¹ bentonite can decrease the fouling rate in comparison to ultrafiltration without bentonite. But no obvious improvement of the NOM retention rate was observed. Besides, precoating the membrane with 500 mg L⁻¹ bentonite does not present a major interest since a considerable increase of fouling rate is obtained compared to experiments without precoating. Membrane fouling reversibility, membrane surface hydrophobicity and molecular weight distribution of solutes contained in the different permeates were also studied.

Keywords: Hybrid Process; Seawater; Ultrafiltration; Adsorption; Fouling; Natural organic matter

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