

## Influence of operating conditions on the retention of fluoride from water by nanofiltration

Imen Bejaoui\*, Amine Mnif, Béchir Hamrouni

UR Dessalement et Traitement des Eaux, Faculté des sciences de Tunis, 2092 Manar II, Tunisia  
Tel/Fax +216 (71) 871 282; email: imenbejaoui28@yahoo.fr

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### ABSTRACT

As any oligoelement, fluoride is necessary and beneficial for human health to low concentrations, but an excess amount of fluoride ions in drinking water has been known to cause undesirable effects, especially tooth and bones fluorosis. Many methods have been used to remove fluoride from water such as precipitation, adsorption, electrocoagulation and membrane processes. In the present study, removal of fluoride ions from aqueous solution was investigated using a polyamide thin film composite nanofiltration membrane denoted HL from Osmonics. This study deals with the characterisation of the HL membrane used in permeation experiments with aqueous solutions of charged inorganic solutes. The effect of feed pressure, concentration, ionic strength, type of cation associated to fluoride and pH on the retention of fluoride ions were studied. The retention of fluoride anions was in the order of 60%. It relatively depends on feed concentration, ionic strength, pH and applied pressure. Spiegler–Kedem model was applied to experimental results in the aim to determine phenomenological parameters  $\sigma$  and  $P_s$  respectively, the reflection coefficient of the membrane and the solute permeability coefficient of ions. The convective and diffusive parts of the mass transfer were quantified with predominance of the diffusive contribution.

*Keywords:* Defluorination; Nanofiltration; Spiegler–Kedem model; Mass transfer

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\* Corresponding author.