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Nanofiltration for the separation of polyvalent and monovalent ions in high saline solutions

R Ibanez, Ortiz P, Urtiaga A and Ortiz I
Universidad de Cantabria, Spain

This work, as part of a global membrane process for the recovery of alkali and acids from reverse osmosis (RO) desalination brines, focuses on the nanofiltration (NF) separation of polyvalent and monovalent anions, more specifically sulfate and chloride. This pretreatment stage plays a key role in the whole recovery process. Working with model brines simulating the concentration of RO concentrates, 0.2-1.2 M chloride concentration and 0.1 M sulfate concentration, the experimental performance and modeling of the NF separation is reported. The study has been carried out with the NF270 (Dow Filmtec) membrane. The effect of operating pressure (500-2000 kPa), ionic strength (0.4-1.3 M) and chloride initial concentration (0.2-1.2 M) on the membrane separation capacity has been investigated. Additionally, the Donnan steric pore model (DSPM) together with experimentally determined parameters, effective pore radius (r_p), thickness of the membrane effective layer (δ) and effective membrane charge density (X_d), was proved accurate enough to satisfactorily describe the experimental results providing the tools for process design and optimization. Finally, In this work, we provide for the first time the analysis of partitioning effects and transport mechanism in the NF separation of sulfate and chloride anions in concentrations that simulate those found in RO desalination brines.

Biography

R Ibanez is an Associate Professor of Chemical Engineering at the Chemical and Biomolecular Engineering Department of the University of Cantabria, Spain. She coordinates the research group IPS "Sustainable Processes Engineering" focusing her work in the research and development of advanced separation technologies and their sustainable applications. She has been involved in more than 30 national and international research projects and has been Coordinator of about 10 research projects. She has published more than 60 papers in reputed journals and participates regularly in international conferences.

ibanezr@unican.es

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