## Experimental design applied to improve the efficiency and the performance of the reverse osmosis process

## Abdelilah Fatni<sup>a,\*</sup>, Abdellatif El Hammadi<sup>a</sup>, Rachid Bouaddi<sup>a</sup>, Abdelaziz Ait Taleb<sup>a</sup>, Noureddine El Baraka<sup>a</sup>, Abdellatif Laknifli<sup>b</sup>

<sup>a</sup>Laboratory of Biotechnology, Materials, and Environment, Physicochemistry of Natural Environments, Materials, and Environment Team, Polydisciplinary Faculty of Taroudant, University Ibn Zohr, Taroudant, Morocco, Tel. +212 639647034; emails: abdelilah.fatni@gmail.com (A. Fatni), a.hammadi@uiz.ac.ma (A. El Hammadi), rach.bouaddi@gmail.com (R. Bouaddi), a.aittaleb@uiz.ac.ma (A. Ait Taleb), barakanour@gmail.com (N. El Baraka)

<sup>b</sup>Laboratory of Biotechnology, Materials, and Environment, Physicochemistry of Materials, Catalysis, and Valorization of Natural Resources Team, Faculty of Sciences, University Ibn Zohr, Agadir, Morocco, email: a.laknifli@uiz.ac.ma

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## ABSTRACT

This research focuses on optimizing the reverse osmosis process applied to water desalination in the Noor 1 Ouarzazate plant. The purpose of this process is to remove salt from brackish water from the Mansour Eddahbi dam. A complete factorial design based on four factors, that is, 2<sup>4</sup>, has been used to evaluate the parameters affecting the desalination efficiency aiming to optimize the conductivity rejection rate, the calcium rejection rate, the magnesium rejection rate, and the transmembrane pressure. Furthermore, a linear mathematical model based on the experimental results has been carried out to estimate the impact of the different parameters considered and their relative interactions. As a result, this study reaches the optimal conditions for the reverse osmosis process, pH is 8, the antiscalant concentration is 6 ppm, the flow rate is 38 m<sup>3</sup> h<sup>-1</sup>, and the redox potential is 100 mV. It also shows that the pH, the antiscalant concentration, and the flow rate are the most statistically significant factors affecting the selectivity of metal ions, while the flow rate is the most influencing factor on the transmembrane pressure. Thus, the results of experience are applied to the process and verify the predicted optimal conditions.

Keywords: Noor 1 Ouarzazate; Water desalination; Reverse osmosis; Metal ions removal; Design experimental

\* Corresponding author.

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