Enhancement of PVDF-based membranes with 2D materials for efficient performance in Membrane Distillation and Membrane Crystallization

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Abstract
Most of membrane transport processes are isothermal and their driving forces are transmembrane hydrostatic pressures, concentrations, electrical or chemical potentials. Membrane Distillation (MD) and Membrane Crystallization (MCr) are non-isothermal processes that actually still needs to be developed for its industrial implementation[1]. These processes are separation technology for treating saline and brine from Reverse osmosis plant such as seawater or brackish water. These operations exploits the hydrophobic nature of the membrane with the possibility to reject 100% of all non-volatiles components contained in the feed solutions[2]. Considered the increasingly demand of fresh and reusable water, our intent is to identify new materials to increase the production and the efficiency of water from desalination with eco-sustainable membrane process. In this direction, graphene and 2D materials are receiving great interest for their additional effect to the host membrane[3]. 2D materials are particular attractive for MD/MCr due to their hydrophobic nature, selective sorption of water vapours and anti-fouling proprieties. In this work Graphene and Bismuth telluride flakes were studied and tested for the enhancement of PVDF membranes in MD and MCr. The flakes were exfoliated with the innovative Wet Jet Mill technique by the colleagues from BeDimensioanl S.P.A[4]. The flakes were incorporated in the membrane during the preparation of the membranes via NIPS. Herein, a summary of the most interesting achievements is given and the behaviour of 2D materials functional membranes is described as a function of chemical composition and salt concentration as well as running conditions selected for membrane operations.

REFERENCES

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FIGURES

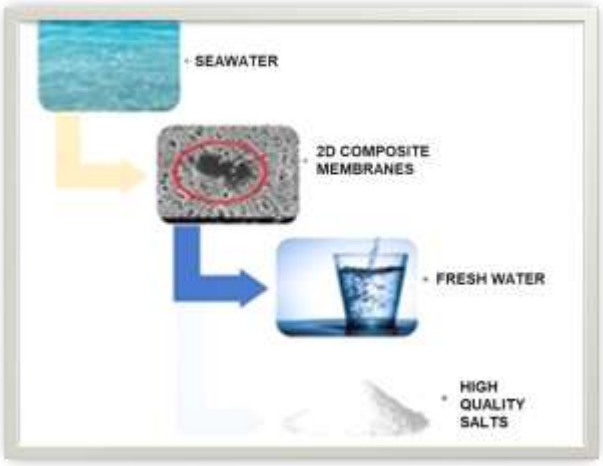

Figure 1: Inclusion of 2D flakes in PVDF-based membrane for desalting highly saline waters and recovery salt crystals