Synthesis of Uio-66 Metal Organic Framework Impregnated Thin-Film Nanocomposite Membrane for the Desalination via Pressure Assisted Osmosis

Authors : Rajesha Kumar Alambi, Mansour Ahmed, Garudachari Bhadrachari, Safiyah Al-Muqahwi, Mansour Al-Rughaib, Jibu P. Thomas

Abstract : Membrane-based pressure assisted osmosis (PAO) for seawater desalination has the potential to overcome the challenges of forward osmosis technology. PAO technology is gaining interest among the research community to ensure the sustainability of freshwater with a significant reduction in energy. The requirements of PAO membranes differ from the FO membrane; as it needs a slightly higher porous with sufficient mechanical strength to overcome the applied hydraulic pressure. The porous metal-organic framework (MOF) as a filler for the membrane synthesis has demonstrated a great potential to generate new channels for water transport, high selectivity, and reduced fouling propensity. Accordingly, this study is aimed at fabricating the UiO-66 MOF-based thin film nanocomposite membranes with specific characteristics for water desalination by PAO. A PAO test unit manufactured by Trevi System, USA, was used to determine the performance of the synthesized membranes. Further, the synthesized membranes were characterized in terms of morphological features, hydrophilicity, surface roughness, and mechanical properties. The 0.05 UiO-66 loaded membrane produced highest flux of 38L/m2h and with low reverse salt leakage of 2.1g/m²h for the DI water as feed solution and 2.0 M NaCl as draw solutions at the inlet feed pressure of 0.6 MPa. The new membranes showed a good tolerance toward the applied hydraulic pressure attributed to the fabric support used during the membrane synthesis.

Keywords : metal organic framework, composite membrane, desalination, salt rejection, flux

Conference Title : ICDRE 2022 : International Conference on Desalination and Renewable Energy

Conference Location : Dubai, United Arab Emirates

Conference Dates : October 13-14, 2022