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Graphene oxide incorporated thin film nanocomposite membrane at low concentration monomers

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Abstract:

A high flux thin film nanocomposite (TFN) nanofiltration (NF) membrane under low pressure (4 bars) was prepared through a facilitated interfacial polymerization (IP) reaction between low concentrations of piperazine (PIP) and organic trimesoyl chloride (TMC) in the presence of graphene oxide (GO) nanosheets. The prepared GO-TFN membranes exhibited an improved water flux and chlorine-resistance performance without compromising the salt rejection. At the optimized GO dosage of 0.01wt%, the synthesized GO-TFN membrane achieved a water permeance of 15.63 $L/m^2 \cdot h \cdot bar$ with the Na_2SO_4 rejection of 96.56% and $MgSO_4$ rejection of 90.5%. The characterization of the TFN membranes by SEM, AFM, zeta potential and FTIR revealed that that GO nanosheets improved the surface roughness, hydrophilicity and surface charges at low PIP and TMC concentrations, leading to both high water flux and salt rejection. The GO-TFN membrane also exhibited enhanced anti-chlorine ability. The study provides new insights into the development of low-pressure NF membranes with superior performance.

Keywords: Thin film nanocomposite; Graphene Oxide; Nanofiltration; Interfacial polymerization; Low pressure

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