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## Development of a new nanofiltration membrane for removal of kinetic hydrate inhibitor from water

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### Abstract

Kinetic Hydrate Inhibitors (KHIs) are added to the produced fluids in natural gas fields to prevent hydrate formation. Because KHI dissolved into produced water may have a negative impact on the environment, an effective treatment method is needed to remove KHI. A novel thin film nanocomposite (TFN) nanofiltration (NF) membrane was prepared with polyphenylsulfone (PPSU)/graphene oxide (GO) blended support membrane fabricated by the phase inversion method and with a polyamide (PA) selective layer formed by interfacial polymerization over the surface of the PPSU (TFC) and PPSU/GO supports. The performance of the NF membranes was investigated in terms of the pure water flux (PWF),  $\text{MgSO}_4$  rejection and KHI rejection under different operating pressures and feed concentrations. The TFN membrane embedded with 0.1 wt. % GO exhibited higher permeate flux than the TFC membrane, with no significant change in KHI rejection. The KHI rejection of 99% and permeation flux of  $32.7 \text{ L/m}^2\cdot\text{h}$  (at 9 bar and feed concentration of 0.5 wt. % KHI) were achieved, suggesting that the TFN membrane has potential as an application for KHI removal from water. The prepared TFN membrane also showed a significant antifouling property due to the improved smoothness of the membrane surface.

**Keywords:** Kinetic hydrate inhibitor (KHI), Nanofiltration (NF), Thin film nanocomposite (TFN), Graphene oxide (GO), Polyphenylsulfone (PPSU)

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