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Chlorine Resistant TFN Nanofiltration Membrane Incorporated with Octadecylamine-grafted GO and Fluorine-containing Monomer

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ABSTRACT: This work describes a novel nanofiltration membrane fabrication strategy in which the octadecylamine-grafted GO with the organophilic property is incorporated in organic phase during interfacial polymerization (IP) in order to protect the polyamide backbone from the attack of free chlorine. Meanwhile, the aqueous phase containing mixed amines of piperazine (PIP) and the fluorine-containing monomer (2,2'-bis(1-hydroxyl-1-trifluoromethyl-2,2,2-trifluoroethyl)-4,4'-methylenedianiline, BHTTM) enables further improvement in chlorine resistance of the thin film nanocomposite (TFN) membrane. The modified GO was systematically characterized by TEM, FT-IR, TGA and XRD. And the membrane properties were investigated by XPS, TEM, AFM and dynamic contact angle. The octadecylamine-grafted GO TFN membrane (TFNMA-GO-ODA) exhibits measurably smoother and less hydrophilic surface compared to TFC membrane with mixed amines as well as the similarly fabricated GO TFN membrane. The TFNMA-GO-ODA demonstrated a pure water flux of $49.6 \text{ L m}^{-2} \text{ h}^{-1}$ (0.6 MPa), which was nearly 2.5 times than that of pristine PIP TFC membrane and 1.6 times than that of mixed-amine TFC membrane, while keeping high Na_2SO_4 rejection of 98.4%. More importantly, the TFNMA-GO-ODA presented excellent chlorine resistance, benefiting from the existence of fluorine-containing groups in BHTTM and the protective effect of stable graphene nanosheets. The results indicate great potential of such membrane in water desalination and purification in industrial scale.

KEYWORDS: *nanofiltration membrane preparation; modified graphene oxide; interfacial polymerization; chlorine resistant; octadecylamine*

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