Fluoride Removal Using Nanofiltration-Ranged Polyamide Thin-Film Nanocomposite Membrane Incorporated Titanium Oxide Nanosheets	
Authors	**Fekri Abdulraqeb Ahmed Ali, Javed Alam, Saif MH Qaid, Arun Kumar Shukla, Ahmed S Al-Fatesh, Ahmad M Alghamdi, Farid Fadhillah, Ahmed I Osman, Mansour Alhoshan**
Publication Year	2024
Grant Number	IFP-IMSIU-2023130
DOI link	10.3390/nano14080731

Abstract: Drinking water defluoridation has attracted significant attention in the scientific community, from which membrane technology, by exploring thin film nanocomposite (TFN) membranes, has demonstrated a great potential for treating fluoride-contaminated water. This study investigates the development of a TFN membrane by integrating titanium oxide nanosheets (TiO_2 NSs) into the polyamide (PA) layer using interfacial polymerization. The characterization results suggest that successfully incorporating TiO_2 NSs into the PA layer of the TFN membrane led to a surface with a high negative charge, hydrophilic properties, and a smooth surface at the nanoscale. The TFN membrane, containing 80 ppm of TiO_2 NSs, demonstrated a notably high fluoride rejection rate of 98%. The Donnan-steric-pore-model-dielectric-exclusion model was employed to analyze the effect of embedding TiO_2 NSs into the PA layer of TFN on membrane properties, including charge density (Xd), the pore radius (rp), and pore dielectric constant (εp). The results indicated that embedding TiO_2 NSs increased Xd and decreased the εp by less than the TFC membrane without significantly affecting the rp. The resulting TFN membrane demonstrates promising potential for application in water treatment systems, providing an effective and sustainable solution for fluoride remediation in drinking water.

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