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Fabrication and separation performance of polyethersulfone / Sulfonated TiO₂ (PES-STiO₂) ultrafiltration membranes for fouling mitigation

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Highlights

- A new hydrophilic surface-modified additive, sulfonated TiO₂, was prepared
- The PES/STiO₂ modified UF membranes were prepared via phase inversion method
- For the P-STiO₂, 102.4 % showed higher water flux compared to PES membrane
- The STiO₂ membranes showed lower R_{ir} fouling resistance of 3.4 % than TiO₂ (23.2 %)
- -SO₃H group in the STiO₂ has a stronger hydrophilic group, than to the TiO₂

Abstract

Polyethersulfone (PES) / sulfonated TiO₂ (STiO₂) nanoparticles (NPs) UF blended membranes were fabricated with different loadings of STiO₂. The modified membranes exhibited significant improvement in surface roughness, porosity, and pore size when compared to the PES membrane. The P-STiO₂ 1 and P-TiO₂ 1 blended membranes exhibited higher water flux, approximately 102.4% and 62.6%, respectively, compared to PES. SPP-STiO₂ and P-STiO₂ showed lower R_{ir} fouling resistance than the P-TiO₂ blended membrane. Overall, the STiO₂-blended membranes provide high hydrophilicity permeability, anti-fouling performance, and improved BSA rejection attributed to the hydrogen bonding force and more electrostatic repulsion properties of STiO₂.

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