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Fabrication and separation performance of polyethersulfone / Sulfonated TiO_2 (PES-$STiO_2$) ultrafiltration membranes for fouling mitigation

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Highlights

- A new hydrophilic surface-modified additive, sulfonated TiO_2, was prepared
- The PES/$STiO_2$ modified UFmembranes were prepared via phase inversion method
- For the P- $STiO_2$, 102.4 % showed higher water flux compared to PES membrane
- The $STiO_2$ membranes showed lower Rir fouling resistance of 3.4 % than TiO_2 (23.2 %)
- $-SO_3H$ group in the $STiO_2$ has a stronger hydrophilic group, than to the TiO_2

Abstract

Polyethersulfone (PES) / sulfonated TiO_2 ($STiO_2$) nanoparticles (NPs) UF blended membranes were fabricated with different loadings of $STiO_2$. The modified membranes exhibited significant improvement in surface roughness, porosity, and pore size when compared to the PES membrane. The P-$STiO_2$ 1 and P-TiO_2 1 blended membranes exhibited higher water flux, approximately 102.4% and 62.6%, respectively, compared to PES. SPP-$STiO_2$ and P-$STiO_2$ showed lower Rir fouling resistance than the P-TiO_2 blended membrane. Overall, the $STiO_2$-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 $STiO_2$.