

MECHANISMS OF TRANSPARENT EXOPOLYMER PARTICLES (TEPs) FOULING ON ULTRA-FILTRATION AND ITS REDUCTION BY PVDF/N-TiO₂

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ABSTRACT

Research was carried out on the mechanisms of membrane fouling. Among a variety of foulants, transparent exopolymer particles (TEPs), which play an important role in biofilm formation and membrane fouling, have been overlooked for many years due to their invisibility. Here TEPs were first separated from *Chlorella Vulgaris* culture broth and quantified via Alcian Blue staining method as reported in the literature. Other characterizations included particle-size-distribution and zeta potential measurements.

Then the fouling characteristics of ultrafiltration membranes by TEPs were assessed. The fabricated and tested hollow fiber membranes included conventional polyvinylidene fluoride membrane (PVDF) and mixed matrix membranes with titanium dioxide (PVDF/P25) or nitrogen doped titanium dioxide (PVDF/N-TiO₂) nanoparticles integrated into the PVDF matrix. Membranes were characterized by scanning electron microscopy (SEM) and fouling resistance evaluations were performed under dark or visible light irradiation conditions for comparison. A significant enhancement of fouling resistance was observed for PVDF/N-TiO₂ membrane under visible light irradiation. The addition of TiO₂ nanoparticles into the PVDF matrix apparently improved surface hydrophilicity and the nanoparticles could be activated under light, which contributed to the enhanced anti-fouling properties of the membrane.