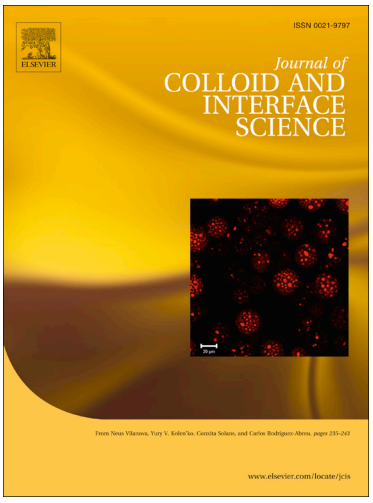

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A novel strategy to develop antifouling and antibacterial conductive Cu/polydopamine/polyvinylidene fluoride membranes for water treatment

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Abstract

Membrane fouling problem impedes widespread application of polyvinylidene fluoride (PVDF) membrane for water treatment. This study proposed a novel strategy to endow hydrophobic PVDF ultrafiltration (UF) membrane with good antifouling and antibacterial activity. The novel strategy includes 3 steps: polydopamine (PDA) modification, Ag catalytic activation and electroless Cu plating. Via this strategy, copper nanoparticles (CuNPs) were *in situ* immobilized on PVDF membrane. The adhesive PDA layer not only facilitated to firm attachment of CuNPs, but also increased surface hydrophilicity. Scanning electron microscope (SEM) and X-ray photoelectron spectroscopy (XPS) analyses confirmed successful immobilization of CuNPs, which improved surface hydrophilicity and absolution value of negative zeta potential as compared with the pristine PVDF membrane. Meanwhile, the modified Cu/PDA/PVDF membranes had relatively high conductivity, significantly improving antifouling performance when 0.30 $V \cdot cm^{-1}$ of external electrical field was applied. Antibacterial tests revealed that the modified membrane possessed significantly enhanced antibacterial activity against live *E. coli*. The novel modification strategy in this study gave important implications for membrane fabrication, and the modified membrane possessed attractive potentials in water treatment.

Keywords: surface modification; hydrophilicity; PVDF membrane; antibacterial; antifouling; water treatment