Preparation and antibacterial property of SiO$_2$–Ag/PES hybrid ultrafiltration membranes

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ABSTRACT

Polyethersulfone (PES) ultrafiltration membranes with antibacterial property were prepared by blending with SiO$_2$–Ag composites via immersion precipitation phase inversion method. In this study, silica sol was prepared by tetraethoxysilane via hydrolysis and polymerization, then silica was mixed with AgNO$_3$ solution, and silver nanoparticles were deposited on the surface of SiO$_2$ via reduction reaction. FTIR spectra results showed that silica sol was prepared successfully. SiO$_2$–Ag composites were characterized by transmission electron microscopy (TEM). The hybrid membranes were characterized by permeation properties testing, scanning electron microscopy (SEM), and antibacterial activity analysis. The permeation properties testing indicated that the modified membranes had higher pure water flux than the pure PES membrane. SEM results showed that the structure of membrane was not obviously affected by addition of SiO$_2$–Ag composites. The antibacterial effect of the SiO$_2$–Ag/PES hybrid membrane was assayed with *Escherichia coli* and *Staphylococcus aureus* cultures and evaluated with the viable cell count method, and the antibacterial rates of the hybrid membranes against *E. coli* and *S. aureus* could reach 100%.

Keywords: Silica sol; SiO$_2$–Ag; PES ultrafiltration membrane; Antibacterial activity

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