عنوان مقاله:

Improving Hydrophilicity of Polyethersulfone Membrane Using Silver Nanoparticles for Humic Substances Removal

محل انتشار:

ماهنامه بین المللی مهندسی, دوره 31, شماره 8 (سال: 1397)

تعداد صفحات اصل مقاله: 9

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خلاصه مقاله:

Silver-impregnated membrane was facilely prepared by ex situ silver nanoparticles (NPs) blending method using polyethersulfone (PES) as the base polymer. A total of three membranes [F1(S0), F2(S0.5) and F3(S2.0)] were fabricated at different weight percentages of polymer and silver (Ag) loadings to compare their effects on membrane morphological and performance properties. All membrane types were characterized using scanning electron microscope (SEM), energy-dispersive X-ray, Fourier-transform infrared spectroscopy, zeta potential analyzer and contact angle analysis. Characterization data and background theories from the literature were used to study and relate the effect of silver nanoparticles (AgNPs) on the physicochemical properties of the PES/Ag composite membranes with respect to pure water permeability, structural property, surface charge and surface hydrophilicity. Solute rejection performance and antibacterial property of the PES/Ag composite membranes were performed using humic acid (HA) and Escherichia coli (E. Coli) bacteria. The results showed that the membrane with the highest Ag loading (F3) exhibited the highest pure water permeability among all the composite membranes. This phenomenon could be attributed to the morphological changes of the membrane due to the addition of Ag. In this study, contact angle of the membranes showed decreasing trend with the addition of Ag as well as the increase in Ag loading. On the contrary, pore radius of the membranes was found increased with increasing in Ag loading. Owing to this, the F3 membrane demonstrated relatively lower HA rejection (i.e. 89.55%) compared to the pure PES membrane. In terms of the antibacterial performance evaluation, one can confidently state that the membranes with the addition of Ag showed excellent property in biofouling mitigation based on numerous dead E. coli observed on the membrane surface under SEM analysis.

کلمات کلیدی:

antibacterial, E. coli, Hydrophilicity, polyethersulfone, Silver nanoparticle