

The polyamide membranes functionalized by nanoparticles for biofouling control

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ABSTRACT

This paper presents the results on the modification of polyamide (PA) membranes using nanostructures such as titanium dioxide nanoparticles (TiO₂ NPs) and zinc oxide nanotubes (ZnO NTs) used to provide the antibiofouling properties. Plasma treatments with argon (Ar) and mixture of argon (Ar) and oxygen (O₂) were used to activate the surface of flat-sheet membrane in order to facilitate the attachment of TiO₂ NPs and ZnO NTs. As a consequence, TiO₂ NPs and ZnO NTs were enabled to be attached to the membrane surface. Scanning electron microscopy and X-ray photoelectron spectroscopy were used to characterize the particles deposited on the treated membranes and the strength of the nanostructures fixation to the membrane surface. It was found that the plasma activation with Ar-O₂ enabled more stable deposition and fixation of NPs on a membrane surface compared with Ar plasma treatment. It was also found that the filtration properties of both modified membranes were higher compared with the native one. The microbiological experiments showed that ZnO-modified membranes had stronger antibacterial properties than TiO₂-modified membrane.

Keywords: Polyamide membranes; Plasma; TiO₂ NPs; ZnO NTs; Antibacterial properties

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