



Biocide modification of ultrafiltration membranes using nanofiber structures

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ABSTRACT

Membrane biofouling has a negative effect on membrane performance. Commercial ultrafiltration (UF) membranes were therefore modified using polymeric nanofibers in order to gain additional water treatment functionality. In this case, membrane surface was modified using biocidal electrospun polyurethane nanofibers. It has been found that the inorganic silver in form of reduced silver nitrate is a feasible modification of nanofiber structure, and electrospinning conditions were optimized to maximize silver particle content. Two possible methods were verified for preparing composite UF membranes with antibacterial properties using: (a) direct nanofiber deposition and (b) thermal pressure lamination. Hydrodynamic properties of the developed membranes were tested on an AlfaLaval M10 unit. It has been found that the added functionality comes at the expense of lower permeability. Biocide properties over both short- and long-term operation were confirmed through cultivation techniques and respirometry with *Escherichia coli* while concurrently monitoring how the added silver leached from the nanofiber layer. The results indicate that UF membranes modification using silver-treated nanofibers is a promising technique worth future study and evaluation for advanced water treatment.

Keywords: Composite membranes; Biofouling; Ultrafiltration; Nanofibers; Silver; Biocide properties; Water treatment

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