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Optimisation of thin film composite nanofiltration membranes based on laminated nanofibrous and nonwoven supporting material

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ABSTRACT

The electrospun nanofibrous membranes are one of the emerging technologies for membrane filtration; however, the applications of nanofibrous membranes hindered by their low mechanical strength and lab-scale production method. This work describes the fabrication of composite membranes consisting of the following three-layer system: a nonwoven part as the supporting material, a nanofibrous scaffold as the porous layer, and an active barrier layer. The nonwoven part and the nanofibrous scaffold were laminated together to achieve the required mechanical strength and adhesion. Formation of the active barrier layer was carried out by optimising four parameters: the monomer solution concentration, the reaction time for monomer polymerisation, the drying time and the post-treatment temperature. At each step of the process, one of the optimum conditions, indicated by filtration performance and the investigation proceeded to the next step. The filtration performance of the fabricated thin film nanofibrous composite (TFNC) membranes was done by the dead-end cell. The TFNC membrane based on m-phenylenediamine monomers showed a high rejection (93.5%) of NaCl ions at a low flux. The flux performances of the piperazine monomer-based TFNC membranes showed high $MgSO_4$ salt rejection (95.6 %) and flux at the same time.

Keywords: Nanofiltration; Interfacial polymerization; Nanofibres; Lamination; Desalination

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