

Nonwoven membrane modification by 4-vinyl pyridine grafted polyvinyl alcohol for resistance the adhesion of bacteria

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ABSTRACT

Membranes suffer from operational problems due to fouling in water filtration. Fouling is caused by the build-up of chemicals, bioorganic materials, and biofilms at the membrane surface. The focus of this study was the fabrication and characterization of 4-vinyl pyridine grafted polyvinyl alcohol (PVA-g-4VP) and the modification of nonwoven membrane (NWF) for the prevention of bacterial attachment. The graft copolymerization using Ce(IV) as an initiator was carried out in an aqueous solution. With keeping other conditions constant, the optimum conditions were shown as follows: [Ce(IV)] = 4 mmol/l, [4VP] = 0.15 mol/l, reaction temperature = 60°C, reaction time = 240 min. NWF membranes were modified by coating of PVA-g-4VP with different graft concentrations, and quaternization of the pyridine groups with benzyl bromide. A significant surface enrichment of vinyl pyridine polymer side chains was observed by Fourier transform infrared-attenuated total reflectance. The permeability of the membrane was reduced after modification. The antimicrobial activity of the modified membrane was measured by 2,3,5-triphenyl tetrazolium chloride-dehydrogenase. The PVA-g-4VP modified NWF membrane exhibited a higher antimicrobial activity at a higher graft concentration than PVA modified NWF membrane.

Keywords: 4-vinyl pyridine grafted polyvinyl alcohol (PVA-g-4VP); Microfiltration membrane; Antimicrobial activity

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