SURFACE MODIFICATION OF REGENERATED CELLULOSE FOR IMPROVED ANTI-BIOFOULING PROPERTIES

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ABSTRACT

Membrane filtration is increasingly used for municipal and industrial wastewater treatment because it is an effective way to filter out bacteria and organic material. One of the largest problems affecting this process is biofouling of the membranes leading to blocking of the membrane pores with organic biofilms. Such blockages require expensive interruptions to the filtration process for periodic cleaning and can cause a decrease in membrane lifespan due to the cleaning agents being made up of predominantly harsh oxidising chemicals. The ideal solution to the biofouling problem would be the production of novel polymeric membranes that prevent biofilm formation. Theoretically, this can be accomplished by manufacturing membrane surfaces to which bacteria and organic foulants are incapable of adhering. In the present study, surface modification of regenerated cellulose membranes to introduce zwitterionic hydrophilic copolymers revealed that grafting of copolymers of N-vinylpyrrolidone (NVP) and maleic anhydride (MAnh) could be achieved through an R-group approach of RAFT-mediated polymerization. The MAnh contained in the polymer backbone or as end-groups of the grafted polymers were converted to zwitterionic compounds and upon exposure to bacteria, these membranes limited adhesion of extracellular polymeric substances (EPS) and bacterial cells to the membrane surface compared to unmodified cellulose membranes.