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Bio-Inspired Immobilization of Casein-Coated Silver Nanoparticles on Cellulose Acetate Membranes for Biofouling Control

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Abstract: This study shows the results of low-biofouling nanocomposite membranes, loaded with casein-coated silver nanoparticles (casein-Ag-NPs). Membranes were cast and imbedded with Ag-NPs using two approaches, physical blending of Ag-NPs in the dope solution (^PAg-NP/CA membranes) and chemical attachment of Ag-NPs to cast membranes (^CAg-NP/CA membranes), to determine their biofouling control properties. The functionalization of Ag-NPs onto the CA membranes was achieved via attachment with functionalized thiol groups with the use of glycidyl methacrylate (GMA) and cysteamine chemistries, which was inspired by the affinity of silver to the thiol groups of cysteine proteins in bacteria. The immobilization chemistry successfully prevented leaching of silver nanoparticles during cross-flow studies. *Pseudomonas fluorescens* Migula in brackish water was used for dead-end filtration, where ^CAg-NP/CA membranes displayed lower a significant reduction in the accumulation of bacterial cells, likely due to the more dispersed nanoparticles across the surface.

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