Inclusion of silver nanoparticles for improving regenerated cellulose membrane performance

L. Gelde [(1)], M.A. Casado [(2)], M.I. Vázquez [(1)], I. Llamas [(1)], R.J. Contreras [(2)], J.M. López-Romero [(2)], J. Benavente [(1)]

[(1)] *Departamento de Física Aplicada I. Facultad de Ciencias. Universidad de Málaga. E-29071 Málaga. Spain.*

[(2)] *Departamento de Química Orgánica. Facultad de Ciencias. Universidad de Málaga. E-29071 Málaga. Spain.*

Cellulose is an important material for membrane manufacture due to its high hydrophilic character, which helps to reduce membrane fouling during solutions separation processes. Moreover, cellulose is the most abundant natural biopolymer forming the basic material in the cell-wall of most plant cells and, consequently, it is considered a promising polymeric resource due its relative low cost [1]. However, the mechanical stability of regenerated cellulose (RC) membranes needs to be improved for filtration applications. In such case, the inclusion of metallic nanoparticles in the structure of the RC membranes may improve their mechanical resistance, but that modification could also affect some other electrochemical transport parameters associated to salt and ions diffusive transport.

This paper shows the preparation of silver nanoparticles (AgNPs) and Janus silver nanoparticles (JAgNPs) and their inclusion in the structure of a dense but highly hydrophilic RC membrane by deep coating in water solutions of the corresponding kind of NPs. Silver nanoparticles were obtained by the sodium citrate method already referenced [2], while the Janus character was obtained by immersion interface procedure [3]. Information on elastic, electrical and diffusive properties of the original RC membrane and after nanoparticles modification (RC/AgNPs and RC/JAgNPs, respectively) have been obtained by straight-strength curves and impedance spectroscopy measurements with dry samples, as well as by membrane potential and salt diffusion experiments, being these two latter performed with NaCl solutions at different concentrations [4]. Changes in transport parameters across nano-engineering membranes when compared with the original cellulosic support are analysed; moreover, possible differences in those parameters obtained for RC/AgNPs and RC/JAgNPs membranes were also considered and the results correlated with some nanoparticles characteristics.

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