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Influence of Layer-by-Layer Coating Parameters on the Properties of Hybrid Membrane for Water Treatment

Authors : Jenny Radeva, Anke-Gundula Roth, Christian Goebbert, Robert Niestroj-Pahl, Lars Daehne, Axel Wolfram, Juergen WIese

Abstract : The presented investigation studies the correlation between the process parameters of Layer-by-Layer (LbL) coatings and properties of the produced hybrid membranes for water treatment. The coating of alumina ceramic support membrane with polyelectrolyte multilayers on top results in hybrid membranes with increased fouling resistant behavior, high retention (up to 90%) of salt ions and various pharmaceuticals, selectivity to various organic molecules as known from LbL coated polyether sulfone membranes and the possibility of pH response control. Chosen polyelectrolytes were added to the support using the LbL-coating process. Parameters like the type of polyelectrolyte, ionic strength, and pH were varied in order to find the most suitable process conditions and to study how they influence the properties of the final product. The applied LbL-films was investigated in respect to its homogeneity and penetration depth. The analysis of the layer buildup was performed using fluorescence labeled polyelectrolyte molecules and Confocal Laser Scanning Microscopy as well as Scanning and Transmission Electron Microscopy. Furthermore, the influence of the coating parameters on the porosity, surface potential, retention, and permeability of the developed hybrid membranes were estimated. In conclusion, a comparison was drawn between the filtration performance of the uncoated alumina ceramic membrane and modified hybrid membranes.

Keywords : water treatment, membranes, ceramic membranes, hybrid membranes, layer-by-layer modification
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