NANOFILTRATION MEMBRANES MODIFIED BY INTERFACIAL POLYMERIZATION AND POLYELECTROLYTE DEPOSITION FOR IONIC LIQUID RECYCLING FROM BIOMASS HYDROLYSATES

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Modification of porous polysulfone ultrafiltration membranes was performed by deposition of selective layers via either static polyelectrolyte multilayer deposition technique or growing interfacially polymerized skin layers architectured with 3-aminophenylboronic acid. Model feeds using solutions of 20 mM cellobiose, glucose, xylose and fructose and 115 mM of either of two ionic liquids that are commonly employed in biomass hydrolysis, were prepared to test membrane performance. The fabricated composite membranes show increased ionic liquid/sugar selectivity at competitive permeabilities with tweakable molecular weight cut-offs in the nanofiltration range. Both modification techniques were optimized for nearly complete cellobiose rejection (>99%) and with pure water pearmeabilities corresponding to the range 1.0 – 5.0 L/(m^2·h·bar). Overall, polyelectrolyte multilayer membranes showed better permeability at similar rejection performance when compared with interfacial polymerization membranes.

Surface characterization with FTIR confirmed boronic acid incorporation for membranes modified via interfacial polymerization and zeta potential analysis coupled with contact angle measurement showed considerable change in surface charge and hydrophobicity with the multilayer polyelectrolyte membranes.