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Enhancing the conversion of biomass to sugars with perfluorinated membranes

Daniel Campos

Water Street Newport, USA

Ionic liquids (ILs) can be used effectively in the production of sugars from cellulosic biomass. Recovery of the IL-processed biomass requires mixing the mixture with water since the solvent power of ILs is highly dependent on their water content. Given the high cost of ILs, the wet ionic liquid must be dehydrated repeatedly so it can be reused. Experts in the biomass-processing field have identified the dehydration step as being critically important for the economic viability of the IL-mediated processing of biomass. Therefore, this presentation will discuss membrane dehydration of ionic liquids (ILs). CMS has developed chemically and thermally resistant pervaporation membranes that are effective in removing water from ionic liquids. Dehydration of ionic liquids by pervaporation using a hollow fiber composite perfluorinated membrane has been demonstrated. Efficient water removal is observed despite the low driving force for water permeation, e.g., low water activity coefficient. The water permeance is found to be approximately constant over a wide range of water concentration and temperatures. The permeation of ionic liquid through the membrane is negligible, which leads to extremely high water/IL separation factors and, therefore, minimal loss of IL. Results from both laboratory and pilot membrane dehydrators are presented. The advantages of ionic liquids dehydration by pervaporation are discussed.

dcamposd@compactmembrane.com