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APPLICATION OF PERVAPORATION FOR THE IN-SITU RECOVERY OF GREEN SOLVENTS AND BIOFUELS FROM ABE FERMENTATION

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Abstract

Butanol from ABE fermentation is one well-accepted possibility of directly producing biofuels and solvents from biomass and organic residues. However, compared to butanol production from fossil resources, ABE fermentation is economically not competitive. Owing to toxicity of the products for the microorganisms, low productivity and product concentration is observed, leading to high energy demand for product recovery and purification. Thus, a highly efficient recovery process is required for productivity enhancement and product purification for final utilization. Membrane-based organophilic pervaporation among others proved to be an attractive possibility for a continuous, inline and energy-efficient solvent recovery from ABE fermentation broth. Current work focusses on the assessment of performance and separation characteristics of this process under realistic conditions. Synthetic solutions have been used to independently analyze the effects of solvent concentration and the presence of secondary components like residual sugars and nutrient salts. Two different membrane materials, POMS and PDMS, have been investigated using a lab-scale pervaporation test rig. Results indicate that an enrichment of butanol and acetone by a factor of 21 and 32 respectively, can be achieved within a single separation step.

Key words: acetone, biomass, butanol, PDMS membrane, POMS membrane

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