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Butanol production from lignocellulose by simultaneous fermentation, saccharification, and pervaporation or vacuum evaporation

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## Abstract

Techno-economic study of acetone, butanol and ethanol (ABE) fermentation from lignocellulose was performed. Simultaneous saccharification, fermentation and vacuum evaporation (SFS-V) or pervaporation (SFS-P) were proposed. A kinetic model of metabolic pathways for ABE fermentation with the effect of phenolics and furans in the growth was proposed based on published laboratory results. The processes were optimized in Matlab<sup>®</sup>. The end ABE purification was carried out by heat-integrated distillation. **The objective function of the minimization was the total annualized cost (TAC).** Fuel consumption of SFS-P using poly[1-(trimethylsilyl)-1-propyne] membrane was **between 13.8-19.6%** lower than SFS-V. Recovery of furans and phenolics for the hybrid reactors was difficult for its high boiling point. TAC of SFS-P was increased **1.9** times with supplementation of phenolics and furans to 3 gL<sup>-1</sup> each one for its high toxicity. Therefore, an additional detoxification method or an efficient pretreatment process will be necessary.

*Keywords:* Simulation process; membrane separation; heat-pump; intensification; kinetic model

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