Abstract Submitted
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Energy-Efficient Bioalcohol Recovery by Gel Stripping[1] RUTVIK GODBOLE, LAN MA, RONALD HEDDEN, Texas Tech University — Design of energy-efficient processes for recovering butanol and ethanol from dilute fermentations is a key challenge facing the biofuels industry due to the high energy consumption of traditional multi-stage distillation processes. Gel stripping is an alternative purification process by which a dilute alcohol is stripped from the fermentation product by passing it through a packed bed containing particles of a selectively absorbent polymeric gel material. The gel must be selective for the alcohol, while swelling to a reasonable degree in dilute alcohol-water mixtures. To accelerate materials optimization, a combinatorial approach is taken to screen a matrix of copolymer gels having orthogonal gradients in crosslinker concentration and hydrophilicity. Using a combination of swelling in pure solvents, the selectivity and distribution coefficients of alcohols in the gels can be predicted based upon multi-component extensions of Flory-Rehner theory. Predictions can be validated by measuring swelling in water/alcohol mixtures and conducting h HPLC analysis of the external liquid. 95%+ removal of butanol from dilute aqueous solutions has been demonstrated, and a mathematical model of the unsteady-state gel stripping process has been developed.

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