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0273-2289/94/4546—0465$03.00

Introduction to Session 3

Bioprocessing Research Overview

RAKESH BAJPAI[1] AND BARBARA GOODMAN[2]

[1]Chemical Engineering Department, University of Missouri, Columbia, MO; [2]Alternative Fuels Division, National Renewable Energy Laboratory, Golden, CO

Industrial processes typically involve several steps that include pretreatment of raw materials, transformations to form products, and recovery and purification of final product(s). For an approved, economically viable process, it is also essential to include recovery of by-products, recycling of unused raw materials and catalysts, as well as treatment of any waste streams that may be generated. It is a sign of bioprocessing coming-of-age that many research groups have been investigating complex systems involving several of the abovementioned steps. It is also recognized that integrating several steps together may be beneficial to overall conversions and to process-economics. The articles in this session deal with such "integrated systems" for production of industrial chemicals.

One article, by Scott et al., reports on utilization of presorted wastepaper as a feedstock for ethanol production. It considers schemes and reactors for initial saccharification, recovery of fermentable sugars, recycling of enzymes, conversion to ethanol, and waste treatment. Two articles deal with simultaneous saccharification and fermentation (SSF); simulations results using mathematical models and experimental observations have been reported. In the first article, Philippidis et al. have explored a continuous, stirred bioreactor for production of ethanol from lignocellulosics. In the second article, South et al. report on different reactor configurations for SSF and for direct microbial conversion of cellulosics to ethanol. Two articles deal with separation of products. The article by de la Rosa et al. reports on ammonia fiber explosion (AFEX) process for utilization of herbaceous crops for recovery of proteins and fermentable sugars by enzymatic saccharification. Kim et al. discuss selection criteria for extractive recovery of products from fermentation broths and provide case studies. Greenbaum et al., deals with the use of photosensitizing ions in photolytic conversions of lignocellulosics into oxygen and hydrocarbons.