Session 3
Bioprocessing Research

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Introduction to Session 3

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Bioprocessing research integrates a wide variety of fields and disciplines to achieve a process with economic and environmental advantages over conventional chemical processing. Specific fields of bioprocessing research typically involve biocatalysis development to identify and improve the enzyme or microorganism, biocatalysis production and retention to provide and maintain biocatalytic activity at the lowest possible cost, raw material treatment and selection to provide low cost substrates that are amenable to biological transformation, reactor design, downstream processing to purify the desired product and recycle nutrients or biocatalysts, and, finally, system integration.

The papers presented at the Sixteenth Symposium on Biotechnology for Fuels and Chemicals address many of the above issues in bioprocessing research. In the area of biocatalyst research and development, the mechanisms of anchorage-dependent and catalytic subunits of cellulosome are investigated as are the chemistries of photosynthetic water splitting using biometallocatalysis. Biocatalysts are selected for a variety of applications to possess maximal activity and minimal substrate and product inhibition. Theoretical techniques to predict the maximum product and biomass yields for a variety of processes are also addressed. Investigations of biocatalyst production and retention focus upon the recycling of cellulases, cell immobilization using fibers and gelatin beads, the immobilization of anaerobic bacteria, the use of membrane bioreactors, and a reactor for continuous cellulose production. A variety of low-cost substrates are investigated for bioconversion, including wastepaper, potato processing residual, municipal solid wastes, fruit peels, and coal. Bioreactors are investigated for their rheological properties, aeration and agitation, mass transport, process control strategies, and ability to transport and retain novel solid substrates such as coal. Finally, detection methods are investigated for monitoring carboxylic acids, and adsorbents are investigated for product recovery.