

Process design and analysis for co-production of biofuels and biochemicals from lignocellulosic biomass

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As the awareness of environmental crisis increases, the utilization of lignocellulosic biomass is becoming increasingly important. In this paper, we develop an integrated process to co-produce biofuels (butene oligomer; BO) and biochemicals (1,3-butadiene; 1,3-BD and adipic acid; ADA) by combining the catalytic conversion and separation process. 1,3-BD and ADA are largely applicable to the synthesis of synthetic rubber and nylon 6,6, respectively, and those of market size are sufficiently tremendous. To mitigate required energy consumption, we perform heat integration using pinch analysis. Through techno-economic analysis, we determine the minimum selling price (MSP) of BO is 989 \$/ton. Moreover, we compare the base case (proposed process) and alternative case, where lignin is produced to heat and electricity, instead of ADA. The result indicates that the absence of lignin utilization leads to a significant increase in MSP (\$2,249/ton). For the two cases, the environmental impact is quantified and compared via life-cycle assessment.