

Integrated process for coproduction of biofuel (butene oligomer) and biochemicals (adipic acid) from lignocellulosic biomass

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We developed a new process coproducing biofuel (butene oligomer; BO) and high-value chemicals (adipic acid; ADA) from lignocellulosic biomass to overcome the challenges of the process producing only biofuel. In the proposed process, the split ratio of gamma-valerolactone (GVL) can be controlled to efficiently produce BO and ADA according to the market situations of products. To show how changes in fuel and chemical production affect the economics of the process, three different strategies are investigated where the GVL split ratio is varied to produce BO and ADA at a ratio of 2:1, 1:1, 1:2. The minimum selling prices of BO are calculated at 4.57, 3.92, 2.58 dollars per gallon of gasoline equivalent in each strategy, indicating the process with BO and ADA production of 1:2 is the most economical. Additionally, key cost drivers for the process are identified from sensitivity and uncertainty analysis. Life cycle assessment (LCA) is performed to investigate the environmental impacts and identify the main contributor for each strategy. The techno-economic analysis and LCA results provided the effects of the coproduction process to the process economics and environment, respectively.