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Comparative early stage assessment of multiproduct biorefinery systems: an application to the isobutanol platform

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Abstract

An early stage assessment method is applied to the production of isobutanol from lignocellulosic biomass, and to three multiproduct portfolios from the conversion of isobutanol: Case 1: production of isobutyl acetate and glycerol tert-butyl ether (GTBE), Case 2: production of isobutyl acetate and ketones, and Case 3: production of isobutyl acetate alkanes. The method screens and compares each route with its equivalent petrochemical counterpart. The method is composed by different indicators involving economic and environmental aspects. Sensitivity analyses were carried out to account for variation in prices, weighting factors and distribution of isobutanol to isobutyl acetate (in multiproduct portfolios). Results show that bio-based isobutanol has advantages over fossil-based isobutanol. In multiproduct systems, case 1 performs better, followed by cases 2 and 3. Screening using economic or environmental aspects show to have a significant effect on the results, where bio-based systems tend to perform better when environmental aspects are included.

Keywords: Early stage assessment, bio-based isobutanol, glycerol tert-butyl ether, ketones, alkanes, isobutyl acetate.

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