Design and Retrofitting of Ultrasound Intensified and Ionic Liquid Catalyzed In Situ Algal Biodiesel Production

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Abstract

In this study, new processes are designed for ultrasound assisted in situ algal biodiesel production using ionic liquid catalyst. Process retrofitting is then conducted using a divided-wall column (DWC) and multistage vapor recompression (MVR). Later, comparative analysis in terms of capital cost, cost of manufacturing (COM), cost of biodiesel, and carbon emission is presented. This study shows that the biodiesel cost is linearly dependent on the cost of feedstock and process economics can be improved by converting glycerol to triacetin. The process with DWC and MVR resulted in a significant saving in COM (13.84%), biodiesel cost (18.24%), utility cost (45.44%) and carbon emissions (45.84%) than those in its counterpart. New major contributions of this work are 1) process design for a novel ultrasound assisted and ionic liquid catalyzed algal biodiesel production, 2) implementation of DWC and MVR and 3) investigation of the uncertainty in the thermodynamic property.

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