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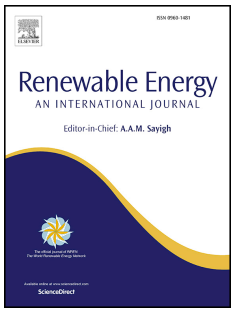

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Rosaura Hernández-Montelongo, Juan Paulo García-Sandoval, Alejandro González-Álvarez, Denis Dochain, Efrén Aguilar-Garnica

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Biodiesel production in a continuous packed bed reactor with recycle: a modeling approach for an esterification system

Rosaura Hernández-Montelongo[a], Juan Paulo García-Sandoval[a,*], Alejandro González-Álvarez[a], Denis Dochain[b], Efrén Aguilar-Garnica[c,**]

[a] *Departamento de Ingeniería Química, Universidad de Guadalajara, 1421 Blvd. Marcelino Garcia Barragán, 44430, Guadalajara, México*
[b] *ICTEAM, UCL, 4 Avenue Georges Lemaître 1348 Louvain-la-Neuve, Belgium*
[c] *Departamento de Química, Universidad Autónoma de Guadalajara, 1201 Av. Patria, 44100, Guadalajara, México*

Abstract

The aim of this work is to propose and to validate a dynamical model for an esterification reaction that was carried out in a relatively new configuration for biodiesel production process: a packed bed reactor with input, output, and recycle. More specifically, the reagents of the esterification process were free fatty acids (FFA) contained in canola oil and low cost methanol (LCM), whereas a commercial cation exchange resin (Purolite CT725) was used as a solid-acid catalyst. The effects of both the LCM volumetric inflow rate and the inflow FFA molar fraction were investigated. The dynamical model was built considering the following assumptions: 1) the reactor was modeled as a CSTR due to the high ratio of recycling volumetric flow to reactor volumetric inflow and 2) the kinetic expression in the model is written in terms of activity coefficients in the light of the non-ideal behavior of the esterification reaction. A satisfactory agreement between the experimental data and the proposed model was obtained. Thus, the resulting model may be advised as a valuable tool for the analysis, control, and optimization of continuous packed bed reactors where the esterification of

*Corresponding author: paulo.garcia@cucei.udg.mx
**Corresponding author: efren.aguilar@edu.uag.mx