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Intensification of Ethyl Esters Synthesis Using a Packed-Bed Tubular Reactor at Supercritical Conditions

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Abstract : In the present study, the non-catalytic transesterification of soybean oil in continuous mode using supercritical ethanol were investigated. Experiments were performed in a packed-bed tubular reactor (PBTR) and variable studied were reaction temperature (523 K to 598 K), pressure (10 MPa to 20 MPa), oil to ethanol molar ratio (1:10 to 1:40) and water concentration (0 wt% to 10 wt% in ethanol). Results showed that ethyl esters yields obtained in the PBTR were higher (> 20 wt%) than those verified in a tubular reactor (TR), due to improved mass transfer conditions attained in the PBTR. Results demonstrated that temperature, pressure, oil to ethanol molar ratio and water concentration had a positive effect on fatty acid ethyl esters (FAEE) production in the experimental range investigated, with appreciable reaction yields (90 wt%) achieved at 598 K, 20 MPa, oil to ethanol molar ratio of 1:40 and 10 wt% of water concentration.

Keywords : packed bed reactor, ethyl esters, continuous process, catalyst-free process
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