CONTINUOUS HIGH-PRESSURE ENZYMATIC PRODUCTION OF SOYBEAN ETHYL ESTERS IN AN EXPANDED-BED REACTOR

Thiago Savi Colombo[(1)], Marcio A. Mazutti[(2)],
J. Vladimir Oliveira[(3)] and Débora de Oliveira[(3)]*

(1) Department of Food Engineering, URI- Campus de Erechim
Av. Sete de Setembro, 1621, Erechim, RS, 99700-000, BRAZIL

(2) Department of Chemical Engineering
Federal University of Santa Maria
Av. Roraima, 1000, Santa Maria, RS, 97105-900, BRAZIL

(3) Department of Chemical and Food Engineering
Federal University of Santa Catarina – UFSC
Florianópolis, CEP 88800-000, Florianópolis - SC, BRAZIL

Biodiesel may be produced from the transesterification of vegetable oils making it a renewable and biodegradable fuel. Several studies presented in the literature through enzymatic transesterification of vegetable oils and pressurized fluids as solvent in batch mode showed high conversions, making the evaluation of continuous mode a field of great research interest. However, just a few works are found in the literature regarding the enzymatic reaction to produce esters in continuous mode. This configuration is preferable from an economic standpoint, since it allows large time production operation at short intervals to and, provides good reaction yields. In this context, the objective of this work was the production of ethyl esters from soybean oil in pressurized CO_2 using an expanded-bed reactor in continuous mode, using the lipase Novozym 435 as catalyst. A study of process variable such as pressure (100-200 bar), enzyme amount (10-70 g), molar ratio of oil:ethanol (1:9-1:21) and mass ratio of substrate:solvent (1:1-1:3) allowed the determination of the best experimental conditions for biodiesel production. Results show that CO_2 is a good solvent demonstrating acceptable performance for the reactions, leading to conditions of pressure and operating temperature (200 bar and 70°C), mass ratio oil: ethanol (1:9) and th e use of mass ratio of substrate: solvent (1:3), reaching conversions above 90%.

Keywords: Compressed CO_2, enzymatic biodiesel, continuous mode, expanded-bed.

*Corresponding author: debora@enq.ufsc.br