

## Flow-Through Supercritical Installation for Producing Biodiesel Fuel

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**Abstract :** A flow-through installation was created and manufactured for the transesterification of triglycerides of fatty acids and production of biodiesel fuel under supercritical fluid conditions. Transesterification of rapeseed oil with ethanol was carried out according to two parameters: temperature and the ratio of alcohol/oil mixture at the constant pressure of 19 MPa. The kinetics of the yield of fatty acids ethyl esters (FAEE) was determined in the temperature range of 320-380 °C at the alcohol/oil molar ratio of 6:1-20:1. The content of the formed FAEE was determined by the method of correlation of the resulting biodiesel fuel by its kinematic viscosity. The maximum FAEE yield (about 90%) was obtained within 30 min at the ethanol/oil molar ratio of 12:1 and a temperature of 380 °C. When studying of transesterification of triglycerides, a kinetic model of an isothermal flow reactor was used. The reaction order implemented in the flow reactor has been determined. The first order of the reaction was confirmed by data on the conversion of FAEE during the reaction at different temperatures and the molar ratios of the initial reagents (ethanol/oil). Using the Arrhenius equation, the values of the effective constants of the transesterification reaction rate were calculated at different reaction temperatures. In addition, based on the experimental data, the activation energy and the pre-exponential factor of the transesterification reaction were determined.

**Keywords :** biodiesel, fatty acid esters, supercritical fluid technology, transesterification

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