

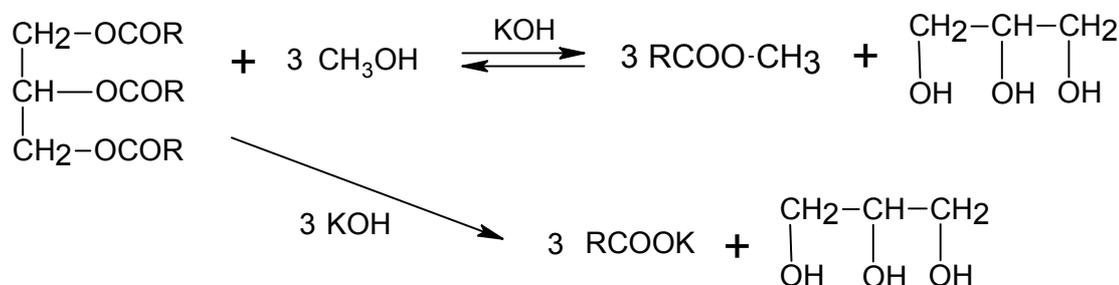
# Optimalization of the Dispersive Reactor for Preparation of Biodiesel

Martin Hájek, František Skopal, Karel Komers, Jaroslav Machek

Department of Physical Chemistry, Faculty of Chemical Technology, University of Pardubice, Pardubice, the Czech Republic

Biodiesel (FAME - Fatty Acid Methyl Esters) is an ecological fuel for combustion engines. It is used as alternative fuel to fuels produced from crude oils. It is produced by transesterification of vegetable oils by low molecular alcohols during basic catalysis (Fig. 1). Biodiesel can be used in nowadays engines without any technological modification requirements.

**Fig. 1:** Simplified reaction scheme of transesterification



where R is hydrophobic rest of fatty acids

A heterogeneous crude reaction mixture forms in the aforementioned reaction. The main products, methylesters (biodiesel) and glycerol are limited in miscibility. During the reaction two phases system occur and the reaction proceeds on the phases boundary. It is very important to ensure high emulgation of the mixture during the reaction. Required state of emulgation in reactor is ensured by special dispersive attachment (IKA®, Germany). The catalysed chemical reaction is influenced by many parameters: temperature and reaction time, amount of catalyst and alcohol, intensity of dispergation and stirring etc. Quality and quantity of both formed phases, ester (biodiesel) and glycerol, were determined by various analytical methods. The system is multivariable, so that the statistic system of Plackett-Burman was applied to plan the experiments. Advantage of this system consists in the fact that only minimum number of experiments is needed to describe the whole system (to determine 7 parameters only 8 experiments are sufficient).

Optimum conditions for the dispersive reactor were found. These conditions ensure that the produced biodiesel meets the limits set by the Euro norm 14214:2003 for usage of biodiesel as a fuel for combustion engines.