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Biofuel synthesis from oils in supercritical methanol and ethers in flow type reactor

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Transesterification reactions of sunflower, rapeseed, corn and cameline oils in supercritical (sc) methanol were studied in a flow tubular reactor over a wide range of methanol (ether)/oil ratio, pressure, temperature, and residence time. Special attention was focused on the studies of the product distribution and how it varies upon variation of the above reaction parameters. Reaction conditions to enable high selectivity and conversion of vegetable oils transesterification were determined. Advantages of the reaction in supercritical alcohols and ethers over similar reaction in the presence homogeneous catalysts were demonstrated. It was found that the oil type produced insignificant effect on the product composition (fatty acid esters) and oil conversion value. The reaction conditions provided the selectivity and high conversion of the oils were selected.

Transesterification of vegetable oils (sunflower, corn) in supercritical esters (methyl and ethyl acetate, diethyl ether) in the flow type reactor was performed. The peculiarities of this reaction in comparison with the transesterification of oils in sc – methanol were studied. It is shown, first, that the ethyl acetate at temperatures above 250°C begins to decompose into acetic acid and gaseous products. Secondly, large amount of free fatty acids, as well as products of not complete transesterification of triglycerides is found in the reaction products.

The main difference the reaction with methyl-, ethyl acetate from similar transformations in sc-methanol is the presence of free fatty acids and products of not complete transesterification of triglycerides (mono - and di - acetate glycerides) in the reaction products.

Biography

V Anikeev has been working in Boreskov Institute of Catalysis of Siberian Branch of Russian Academy of Science since he graduated from Tomsk University in 1975. His major research activities are associated with synthesis and application of nanoparticles, kinetics, thermodynamics, mathematical modeling chemical reactions and processes in sub and supercritical fluids in the Boreskov Institute of catalysis (BIC). Most of the research activities are related to energy productions and environmental protection. He is the author of 178 journal papers, book chapters and journal special issues.

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