

Conversion of fat-containing wastes by acid-catalyzed esterification reaction in systems with controlled phase condition

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Abstract

A two-stage technological scheme is shown for the utilization of fat-containing waste with high free fatty acids contents. According to scheme the first stage provides the separation the oil from free fatty acids by extraction with methanol or ethanol, and in the second stage there are two separated process: acid-catalyzed esterification reaction of free fatty acid, and alkali-catalyzed transesterification of pure vegetable oil according to the traditional technology. For acid-catalyzed esterification the conditions are shown. These conditions allow to reach the high level of fatty acids conversion during the minimum possible reaction time. The results of the conversion are improved through transition of the reaction system to homogenous condition, under presence of H₂SO₄ used as catalyst. The negative role of water impurity in the reaction mixture for the conversion of fatty acids is confirmed and the possibility to weaken this effect due to excess of alcohol in the reaction mixture is shown. The reasons of water influence on conversion are discussed according to the basis of the classical mechanism of the fatty acid esters hydrolysis. Recommendations of the acid-catalyzed esterification conditions of fatty acids by different alcohols (the number of carbon atoms in the chain vary from 1 to 4) are given. These conditions increases the possibilities of the product diversification in the conversion of the fat-containing wastes.

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