EPOXIDATION OF OILS AND ESTERS OF HIGHER FATTY ACIDS – MONITORING OF REACTION

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Current issue is searching for renewable sources for production of various materials or energy, which are currently produced from crude oil. Triacylglycerides, contained in the vegetable oils, animal fats or waste frying oils, are one of the possible renewable sources and can be transformed to ester by transesterification. The other product is glycerol, which has many applications in chemistry, food and pharmaceutical industries. The esters can be transformed to epoxides, which have many applications such as (i) bio-lubricants in means of transport (additives to oils) or (ii) raw material for bio-polymers, higher alcohols, olefins, glycols, polyesters and carbonates. These chemicals are currently produced from crude oil.

The monitoring of epoxidation process is important because it allows to control the degree of epoxidation. Several monitoring methods are usually used, such as determination of iodine value, the epoxide equivalent weight, kinematic viscosity, or infrared spectroscopy. However, these methods are not able to determine the course of epoxidation in detail, they determine only the total decrease of ester content. On the other hand, the chromatographic methods enable to determine each single component of reaction mixture during time, i.e., esters with various degree of epoxidation. The course of epoxidation will be determined by two chromatographic methods and the results will be compared mutually and with the results of other methods. During epoxidation, many intermediates are formed, which will be identified and their dependency on time will be determined. Moreover, various esters with different composition of higher fatty acids will be used, i.e., with different amount of double bonds. The detailed knowledge of reaction course will allow to control better the epoxidation process and so reduce the reaction cost and raw material consumption.

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