



abiosus e.V.

Non-Profit Association for the Advancement of Research on Renewable Raw Materials

2nd Workshop on Fats and Oils as Renewable Feedstock for the Chemical Industry

Program
Abstracts
List of Participants

**22. - 24. March 2009
Emden, Germany**

in Cooperation with:
University of Applied Sciences OOW
German Society for Fat Science (DGF)
Agency of Renewable Resources (FNR)



DGF
Deutsche  Gesellschaft für Fettwissenschaft e.V.

Pavels Karabesko, Maija Strele, Rasma Serzane, Mara Jure, Riga Technical University, Riga, Latvia; pave23@inbox.lv

Biodiesel usually is produced by transesterification of various vegetable oils or animal fats with methanol. Unfortunately, methanol is highly toxic and harmful to human health. Application of bioethanol instead of methanol would lead to more environmentally friendly production technology which almost completely would be based on renewable resources. Currently in Europe there are no biodiesel producers using ethanol as a raw material; nevertheless FAEE (Fatty Acid Ethyl Esters) is used as biodiesel in Brazil. Mandate to CEN for standards for FAEE for use in diesel engines and heating fuels (M/393) was set in 2006.

Previously we explored optimization of the synthesis of rapeseed oil ethyl esters (REE) using anhydrous ethanol and dehydrated ester-aldehyde fractions of ethanol rectification [1]. We were interested to study possibilities of biodiesel preparation from locally produced bioethanol. Therefore our aim was to establish optimal conditions for synthesis of rapeseed oil ethyl esters (REE) by transesterification of oil with bioethanol produced by distillery "Jaunpagasts Plus" from the local wheat. Experiments were carried out at room or higher (75-80°C) temperature; duration of reaction and amount of catalyst were varied. The best results were obtained when reaction was run 1 h at room temperature in the presence of 1.3-1.7% KOH catalyst (from oil mass). When reaction was run at room temperature, yield of biodiesel reached just 71-82%. Therefore we repeated the reaction, adding catalyst-alcohol solution in two steps. The best result (yield of reaction 97%) was reached, when total amount of added potassium hydroxide was 1.5%.

Secondly, we have established optimal conditions for production of REE using ultrasonication, as it is well known that ultrasound assisted transesterification of fatty acids proceed more quickly [2] allowing replacement of batch processing with continuous flow processing and reduction of investment and operational costs. Results of our experiments showed that duration of reaction can be reduced to 0.5 h - twice in comparison with classical method.

Traditional workup process of REE with orthophosphoric acid and water lead to hardly separable emulsion. Therefore we applied Magnesol for purification of REE. Biodiesel treated with Magnesol corresponds to requirements of standard LVS EN 14214 and this method is simpler than workup with acid and water.

We managed to prepare REE with 97% yield in two steps reaction of rapeseed oil with bioethanol of local origin. Also we succeeded to reduce a duration of reaction by ultrasonication (24 kHz) from 1 h to 0.5 h. Simplification of REE purification was reached by application of Magnesol. The technical parameters of our REE corresponded to requirements of LVS EN14214 set for biodiesel.

[1] M. Strele, R. Serzane, G. Bremers, E. Gudriniece. Investigations of oils and fats. 6. Transesterification of rapeseed oil with ethanol. Chemistry Journal of Latvia, 1999, 4, 67-70 (in Latvian).

[2] C. Stavarache, M. Vintoru, R. Nishimura, Y. Maeda. Fatty acids methyl esters from vegetable oil by means of ultrasonic energy. Ultrasonic Sonochem., 2005, 12, 367-372.