



VABILO NA INŠTITUTSKO PREDAVANJE /
INVITATION TO THE INSTITUTE LECTURE

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National Institute of Chemistry, Hajdrihova 19, Ljubljana

**Conversion of Glycerol to Fuel Oxygenates
Through Etherification Reactions**

In order to maintain biodiesel production economically feasible, glycerol obtained as a by-product needs to be utilized in the production of valuable chemicals and fuels [1]. Etherification of glycerol with *iso*-olefins or *tert*-butyl alcohol (TBA) has been considered as an attractive route for its utilization [2,3]. In our studies, glycerol etherification was investigated with TBA, *iso*-butene (IB) and *iso*-amylene (IA), using resin type solid acid catalysts (A-15, A-16, A-36, A-35, DR-2030, Relite EXC8D, Lewatit K2629 etc.). Results proved the importance of pore diffusion resistance, swelling characteristics and thermal stabilities of the resins, as well as their Brønsted acidities, on their performance in glycerol etherification. The highest performance was obtained in the presence of Amberlyst 15, however, performance of A-36 and Relite EXC8D was comparable at higher temperatures. Although TBA has high dissolving capacity of glycerol, water produced as by-product had some negative effects on both the rate and equilibrium of glycerol etherification. Consequently, sorption-enhanced reaction improved conversion of glycerol to ethers. Both A-36 and Dowex DR-2030 showed excellent performance in etherification of glycerol with *iso*-butene at 90 °C. However, oligomerization of *iso*-butene caused inhibiting effect on the etherification yields.

Our recent work proved highly promising results for the etherification of glycerol with C₅ reactive olefins over acidic resin catalysts. Results obtained over A-36 in a temperature range of 120-140 °C proved that glycerol conversion and di-ether selectivity values approaching to 100 and 70 %, respectively, could have been achieved in etherification of glycerol with *iso*-amylene. Comparison of the etherification results obtained in batch and flow reactors also proved the advantages of flow system. Here, a detailed review of our recent results on etherification of glycerol with TBA, *iso*-butene and *iso*-amylene will be reported.

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References:

- [1] Ozbay N., Oktar N., Dogu G., Dogu T., Ind. Eng. Chem. Res. 51(2012) 8788.
- [2] Ozbay N., Oktar N., Dogu G., Dogu T., Int. J. Chem. React. Eng. 8 (2010) A18.
- [3] Ozbay N., Oktar N., Dogu G., Dogu T., Topics Catal. 56 (2013) 1790.

Vijudno vabljeni! / Kindly invited!