Polymer-based catalysts in vegetable oil conversion into biofuel

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Oil-containing biomass is a wide spread material for alternative fuel production in the form of biodiesel. However the production and usage of common biodiesel are connected with several problems, i.e. the dependence of fuel properties from source type and the necessity of additional modification to increase the quality of the product [1]. These problems can be solved by the development of new technologies of triglycerides conversion into various compounds that are divided into two main processes: deoxygenation to produce diesel-like hydrocarbons [2, 3] and hydrogenation to form fatty alcohols [2, 4] which can be used both as highly effective fuel and feedstock of chemical production.

In this work we studied the both stearic acid hydrodeoxygenation and hydrogenation processes in the presence of palladium catalysts on the base of hypercrosslinked polystyrene. Hydrotreatment processes were carried out in a stainless steel reactor-cell of Parr Series 5000 Multiple Reactor System. The analysis of liquid phase samples was performed using GC-2010 chromatograph and GCMS-QP2010S mass spectrometer (SHIMADZU, Japan).

A comparison of catalytic activity was made by TOF value (Fig. 1). It was found that HPS-based catalyst with Pd loading 1 (wt.)% seems to have the highest catalytic activity and selectivity regarding to the target products in both investigated reactions.

It is noteworthy that the selected catalyst (1%-Pd/MN-270) remains its activity and selectivity regarding to the target product at the multiple usage (up to 20 times).

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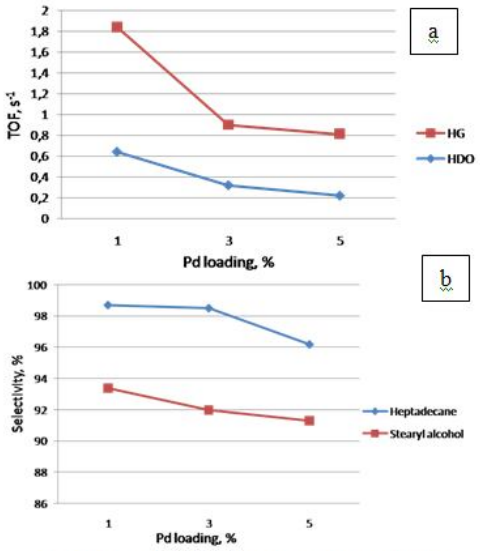


Figure 1 – TOF value (a) and selectivity regarding to target product (b) for HPS-based catalysts in hydrodeoxygenation (blue lines) and hydrogenation (red lines) of stearic acid

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Biography

Professor Dr. Esther M. Sulman, born 1944, studied chemistry at Kalinin Polytechnic Institute and obtained her PhD in the field of chemistry in 1972. In 1989 she obtained her Full Professor (Doctor) degree in the field of kinetic and catalysis. In 1968 Professor Dr. Sulman started her professional career at the Kalinin Polytechnic Institute (at present Tver Technical University (Tver, Russia)) and became the Head of the Department of Biotechnology and Chemistry in 1992. In 2007 she was appointed Director of the Institute of nano- and biotechnologies of Tver Technical University. Her fields of research span fine chemistry, fuel processing, waste processing, biocatalysis and heterogeneous catalysis. Professor Dr. Sulman is author or co-author of about 400 peer-reviewed publications and more than 700 conference papers with regard to catalysis and biocatalysis, 50 patents and 7 books. She received the awards “Honored inventor of USSR” (1989), “Honored chemist of RF” (1999), “Honored Worker of Higher Professional Education of Russian Federation” (1999), “Award of the Government of Russian Federation in the field of science and technology” (2002) and Award medal "For Merit" (2010).

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