Short Communication

Journal of Fundamentals of Renewable Energy and Applications

2021

Vol.11 No.5

Bioenergy 2020: Activity of Ni-based catalysts for hydrotreating of rapeseed oil

Veronika Vachov and Petr Straka

University of chemistry and technology Prague, Czech Republic

Statement of the Problem: The hydrotreating of vegetable oils is nowadays a really promising thanks to produce renewable components of engine fuels. Using reduced nickel-based catalysts for this purpose seems to be very perspective. However, these catalysts are characterized by relatively low stability during the deoxygenation of triglycerides, mainly thanks to the deposition of coke on their surface. For this reason, bimetallic nickel-based catalysts with Ag and Cu promoters were tested and their activities and stabilities were compared. Methodology & Theoretical Orientation: The hydrotreating was performed during a tubular fixed-bed reactor with the co-current flow of a feedstock and hydrogen. Commercially available rape oil was used as a feedstock and Ni, Ni-Ag and Ni-Cu catalysts with γ-Al2O3 support were prepared and tested. Temperatures within the range of 220 – 320 °C, the pressure of 4 MPa, weight hourly space velocity of 1 h-1 and hydrogen to feedstock ratio of 1000 m3•m-3 were used. Findings: For all tested catalysts, the conversion of triglycerides increased with the increasing reaction temperature and therefore the full conversion was achieved for Ni and Ni-Ag catalysts at the reaction temperature of 260 °C and at 280 °C for the Ni-Cu catalyst. The key component of all gaseous products was methane, probably thanks to the strong hydrogenolysis activity of all compared catalysts. Conclusion & Significance: If Ni-Cu/γ-Al2O3 catalyst was used, hydrogenolysis reactions were slightly suppressed and therefore the higher stability at the upper reaction temperatures was observed. For this reason, Ni-Cu/γ- Al2O3 seems to be a perspective catalyst for the hydrotreating of vegetable oils with the aim of the assembly of renewable components of engine fuels.

This work is partly presented at Joint Event on 14th World Congress on BIOFUELS AND BIOENERGY 15th Global Summit and Expo on BIOMASS AND BIOENERGY 36th International Conference on ADVANCED NANOTECHNOLOGY, September 22, 2020 | Webinar