

## Evaluation of Pd/ZSM-5 Catalyst for Simultaneous Reaction of Transesterification and Partial Catalytic Transfer Hydrogenation of Soybean Oil under Supercritical Methanol

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Biodiesel, termed as Fatty Acid Methyl Esters (FAMEs), has an essential role in reducing greenhouse gases by replacing fossil fuel and is needed to be partially hydrogenated to enhance the fuel properties of biodiesel. In this study, biodiesel was synthesized by the simultaneous reaction of transesterification and partial catalytic transfer hydrogenation (CTH) of soybean oil under supercritical methanol over Pd/ZSM-5 or commercial Pd/Al<sub>2</sub>O<sub>3</sub>. At 300 °C, 10 MPa, 45:1 of the molar ratio of methanol: oil with 0.5 mg Pd/g oil for 30 min, FAMEs yields for Pd/ZSM-5 and Pd/Al<sub>2</sub>O<sub>3</sub> were 97.1 % and 58.0 %, respectively. On the other hand, Pd/ZSM-5 was lower active for CTH despite the higher dispersion of Pd nanoparticles (NPs) than Pd/Al<sub>2</sub>O<sub>3</sub>. The reactivity of Pd/ZSM-5 for CTH would be affected by the unique pore structure of ZSM-5 that seems to inhibit the hydrogenation of FAMEs on Pd NPs by confining the reactant diffusion. The lower activity for CTH enabled Pd/ZSM-5 to control CTH in the high temperature. Consequently, the biodiesel obtained by Pd/ZSM-5 had better fuel properties at once than biodiesel standard specification.