Deoxygenation of heptanoic acid over cobalt supported silica catalysts

Ploynisa Phichitsurathaworn[1], Kittisak Choojun [1*], and Tawan Sooknoi [1**]

[1]*Catalytic Chemistry Research Unit and Department of Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Thailand*

*e-mail: kittisak.ch@kmitl.ac.th, **e-mail: kstawan@kmitl.ac.th

The concern of the depletion of petroleum leads to the tremendously research to supply the needs of energy and petrochemicals. Plant oils is an alternative renewable feedstock because their fatty acid composition could convert to alpha olefins. In this work, we investigate the transformation of fatty acids to alpha olefins using heptanoic acid as a model compound using silica supported metal catalysts. At similar condition at 350^{o}C, the conversion of heptanoic acid using 5%wt. of various metal catalysts is in the order of Co > Ni > Cu > Cr. In term of selectivity, the results show that Co/SiO_2 and Ni/SiO_2 were selectively towards 1-hexene, which could derive from the decarbonylation reaction. In contrast, Cu/SiO_2 and Cr/SiO_2 yielded heptanal via hydrogenation reaction. Upon increasing the reaction temperature from 350 ^{o}C to 425 ^{o}C, ketonization reaction is enhanced indicated by the raising of 7-tridecanone yield. In comparison between Co/SiO_2 prepared by wet impregnation (IMP) and Co/SiO_2 prepared by strong electronic adsorption (SEA), Co/SiO_2 (IMP) showed higher activity than Co/SiO_2 (SEA). However, the order of deactivation is reversed. Nevertheless all of catalysts deactivation due to the strong adsorption of heptanoic acid.

Keywords: Decarbonylation, Fatty acid, Cobalt, Alpha olefin