Upgrading of Alternative Liquid Fuels Derived from Pyrolysis of Waste Solids via Catalytic Hydrotreating Process

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According to requirment of energy sustainability along with environmental concern, alternative energy derived from renewable resources is attractive for every country. In Thailand, the large amount of solid wastes obtained from tires and biomass are seriously environmental problems, but they have high potential to be converted as alternative liquid fuels via pyrolysis. The obtained liquid fuels have high heating value, which can compete to conventional fossil fuels. However, the quality of raw pyrolysis oils is inappropriate for directly using in combustion engines due to contaminations of organosulfurous (ca. 1.15 wt%) and oxygenated compounds (ca. 35-40 wt%) in the pyrolysis oils derived from waste tires and lignocellulosic biomass, respectively. The quality of them can be improved via catalytic hydrotreating process similar to one used in the conventional oil refinery. For waste tire pyrolysis oil (WTPO), the hydrodesulfurization over NiMo/γ-Al_2O_3 in the reduced form could decrease the amount of sulfur compounds and achieved the maximum % sulfur removal as 87.8%. For the same catalysts, it could also activate the hydrodeoxygenation of guaiacol, oxygenated model compound, and bio-oil derived from the biomass pyrolysis. It was found that the maximum reduction of O/C mole ratio of bio-oil was ca. 89.9%. Moreover, the addition of some promoters such as Cu and Ce could enhance the hydrodeoxygenation efficiency and inhibite the coke formation on the catalyst surface, respectively.

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