



A NOVEL UPGRADING PROCESS FOR BIOMASS PYROLYSIS OIL OVER SOLID ACID AND SOLID BASE CATALYSTS

J. Chang

*South China University of Technology, Chemical Engineering Department, Guangzhou, China
changjie@scut.edu.cn*

Biomass pyrolysis is an efficient process of biomass conversion with high yield of liquid fuel, which makes biomass the most promising renewable energy to substitute the conventional fossil fuel. But the disadvantages of bio-oil, such as the high viscosity, instability, severe corrosiveness and complicated composition put a lot of obstacles for its replacing process consequently, and have become a bottle-neck in its applications. An urgent necessity to upgrade bio-oil is demanding. Based on the characteristic of high total amount (10-20wt%) and multi-organic acids existence, A novel process was proposed to upgrade bio-oil over solid acid and solid base catalysts. The solid acid “mix 40STS400” and solid base “30KAN” were employed in upgrading bio-oil by catalytic esterification. Upgrading process by solid acid and solid base catalysts in the conditioned experiment was investigated, in which the gross calorific value increased, dynamic viscosities of bio-oil was lowered markedly, although 8 months of aging did not show much viscosity increase, to improve its fluidity and enhance its stability positively. The physical characterization proved that the connection between high activity and crystalline phase composition, crystallographic state of Ti and existence of SiO₂. And the combination of tetragonal anatase TiO₂, orthorhombic crystal titanium oxide sulfate and cubic crystal titanium with highly-scattered and amorphous SiO₂ ensured the catalyst high esterification activity. It's suggested that SiO₂ helped the formation of Ti-O-Si linkage which enhanced the strong bonding and interaction with SO₄²⁻, and sulfates species bonded were in bidentately chelating and covalent sulfate structure.