

Impact of Zeolite NaY Synthesized from Kaolin on the Properties of Pyrolytic Oil Derived from Used Tire

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Abstract : Solid waste disposal, such as used tires is a global challenge as well as energy crisis due to rising energy demand amidst price uncertainty and depleting fossil fuel reserves. Therefore, the effectiveness of pyrolysis as a disposal method that can transform used tires into liquid fuel and other end-products has made the process attractive to researchers. Although used tires have been converted to liquid fuel using pyrolysis, there is the need to improve on the liquid fuel properties. Hence, this paper reports the investigation of zeolite NaY synthesized from kaolin, a locally abundant soil material in the Benin metropolis as a suitable catalyst and its effect on the properties of pyrolytic oil produced from used tires. The pyrolysis process was conducted for a range of 1 to 10 wt.% of catalyst concentration to used tire at a temperature of 600 oC, a heating rate of 15oC/min and particle size of 6mm. Although no significant increase in pyrolytic oil yield was observed compared to the previously investigated non-catalytic pyrolysis of a used tire. However, the Fourier transform infrared (FTIR), Nuclear Magnetic Resonance (NMR); and Gas chromatography-mass spectrometry (GC-MS) characterization results revealed the pyrolytic oil to possess an improved physicochemical and fuel properties alongside valuable industrial chemical species. This confirms the possibility of transforming kaolin into a catalyst suitable for improved fuel properties of the liquid fraction obtainable from thermal cracking of hydrocarbon materials.

Keywords : catalytic pyrolysis, fossil fuel, kaolin, pyrolytic oil, used tyres, Zeolite NaY

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