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Solid degradation and its kinetics on phenol-rich bio-oil production from pyrolysis of coconut shell and Lamtoro wood residue

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Abstract–The pyrolysis of coconut shell (CS) only, lamtoro (*Leucaena leucocephala*) wood residues (LWR) only, and a CS/LWR mixture was experimentally studied herein for the first time. Additionally, the reaction kinetics of solid destruction during the pyrolysis process of CS and LWR was deduced. An experimental investigation was carried out in a batch reactor at the different pyrolysis temperatures (300-500 °C). The highest phenol yield (30.97%) was observed at 500 °C for the pyrolysis of CS. The activation energy and pre-exponential factor and for degradation of solid were successfully determined for the first time using the Arrhenius equation. The activation energy was determined in the range of 121-153 kJ mol^{-1} for the temperature range of 300-500 °C. Meanwhile, the pre-exponential factors of 3.51×10^{10} s^{-1}, 4.77×10^{10} s^{-1}, and 5.38×10^{10} s^{-1} were calculated for the pyrolysis of CS only, LWR only, and a CS/LWR mixture, respectively. This research presents the mitigation for the alleviation of the energy crisis and to convert underutilized biomass to high-value products.

Keywords: Pyrolysis, Coconut Shell, *Leucaena leucocephala*, Phenol, Reaction Kinetics