Short Abstract

The utilization of lignocellulosic biomass and waste plastics as renewable energy source is becoming progressively essential. The current study was focused on some biomass such as *Cascabela thevetia* (SK), *Delonix regia* (SG), *Samanea saman* (SS), *Phyllanthus emblica* (AM), *Azadirachta indica* (NM), *Manilkara zapota* (CK), *Madhuca longifolia* (MH) *Pinus ponderosa* (PW), *Shorea robusta* (SW) and *Areca catechu* (AN) and plastic (waste nitrile gloves) for their potential towards production of fuels and chemicals. The selected biomass and plastic were examined physicochemically to understand their compositional and structural characteristics. Kinetic analysis was also carried out using TGA analyzer under the non-isothermal condition at dynamic heating rates (5 ^{o}C min^{-1}, 10 ^{o}C min^{-1}, 15 ^{o}C min^{-1}, 20 ^{o}C min^{-1}, and 25 ^{o}C min^{-1}). The kinetic parameters were evaluated using five model-free methods such as Kissinger-Akahira-Sunose (KAS), Ozawa-Flynn-Wall (OFW), Friedman model (FM), Cots-Redfern model (CR) and Distributed activation energy model (DAEM). Thermal, catalytic, co-pyrolysis and effect of biomass bed thickness and distance between successive beds on the pyrolytic product yields were investigated in a semi-batch reactor at optimized condition (500 ^{o}C temperature, 80 ^{o}C min^{-1} heating rate, 0.5 mm particle size and 100 mL min^{-1} sweeping gas flow rate). Additionally, biochars obtained from the pyrolysis were characterized in detail. Results showed that these selected biomass and plastic has the potential to produce renewal fuels and chemicals. Further, kinetic analysis of selected biomass confirmed that activation energy altered with conversion value, due to the diverse composition of biomass. Thermal pyrolysis of these selected biomass confirmed that pyrolytic oil has various problems such as higher viscosity, oxygen content, lower acidity, and heating value, however, catalytic pyrolysis significantly improved the properties of pyrolytic oil. GC-MS results of thermal pyrolytic oil confirmed the presence of higher oxygenated compounds while catalytic pyrolytic oil confirmed a reduction in oxygenated compounds. Effect of bed thickness confirmed that at fourth bed arrangement, liquid properties were found to be more effective with better properties than in first, second, third, fifth and sixth beds. Co-pyrolysis of biomass and plastics showed that their blend enhanced the properties of pyrolytic oil. Finally, the characterization result of biochar showed that biochar can be used as bio-adsorbents, fertilizer and other applications.