Torrefaction of woody biomass in a rotary kiln reactor

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Lignocellulosic biomass is a biomass resource that is present in the largest amount over the world. One of drawbacks of lignocellulosic biomass as a fuel is its low heating value caused by high moisture content up to 50%. In this work, torrefaction of woody sawdust as a representative biomass was carried out in a rotary kiln reactor to enhance its quality as a fuel. Biomass feedstock obtained at a bio-pellet manufacturing company has high moisture contents and was dried to have a moisture content range between 10 an 35 wt%. The delivery rate of the dried feed to the reactor was 20-40 kg/h, having reactor residence times of 20-40 min. Heat supply was achieved by 3 split-zone furnace to have reaction temperatures of 150-350°C. Yield of solid and liquid product were 77.6wt% and 12.0wt%, respectively at 215°C and 30kg/h feeding rate. The heating value (LHV) of the solid product had a range between 4,240-4,900kcal/kg which were at least 8% higher than woody sawdust feeds. Water content of liquid product was about 93wt%. Heat recovery as the solid product was 74.7% at 215°C.