

Solid Biofuel Production by Hydrothermal Carbonization of Wood Shavings: Effect of Carbonization Temperature and Biomass-to-Water Ratio on Hydrochar's Properties

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Abstract : Hydrothermal carbonization (HTC) is recognised as a low temperature and effective technique for the conversion of biomass to solid biofuel. In this study, the effect of process temperature and biomass-to-water ratio (B/W) on the fuel properties of hydrochar produced from wood shavings was investigated. HTC was conducted in an autoclave using reaction temperature of 230 °C and 260 °C for 20 minutes with B/W ratio of 0.11 to 0.43. The produced hydrochars were characterised by the mass yield (MY), higher heating value (HHV), proximate and ultimate properties. The results showed that the properties of the hydrochars improved with increasing process temperature and B/W ratio. The higher heating value (HHV) increased to 26.74 MJ/kg as the severity of the reaction was increased to the process temperature of 260 °C. Also, the atomic H/C and O/C ratios of hydrochars produced at 230 °C and 260 °C were closed to the regions of a peat and lignite on the plotted van Krevelen diagram. Hence, the produced hydrochar has a promising potential as a sustainable solid biofuel for energy application.

Keywords : wood shavings, biomass/water ratio, thermochemical conversion, hydrothermal carbonization, hydrochar

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