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# The Effect of Feedstock Type and Slow Pyrolysis Temperature on Biochar Yield from Coconut Wastes

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**Abstract :** The first objective of this study is to investigate the suitability of coconut frond (CF) and coconut husk (CH) as feedstocks using a laboratory-scale slow pyrolysis experimental setup. The second objective is to investigate the effect of pyrolysis temperature on the biochar yield. The properties of CF and CH feedstocks were compared. The properties of the CF and CH feedstocks were investigated using proximate and elemental analysis, lignocellulosic determination, and also thermogravimetric analysis (TGA). The CF and CH feedstocks were pyrolysed at 300, 400, 500, 600 and 700 °C for 2 hours at 10 °C/min heating rate. The proximate analysis showed that CF feedstock has 89.96 mf wt% volatile matter, 4.67 mf wt% ash content and 5.37 mf wt% fixed carbon. The lignocelluloses analysis showed that CF feedstock contained 21.46% lignin, 39.05% cellulose and 22.49% hemicelluloses. The CH feedstock contained 84.13 mf wt% volatile matter, 0.33 mf wt% ash content, 15.54 mf wt% fixed carbon, 28.22% lignin, 33.61% cellulose and 22.03% hemicelluloses. Carbon and oxygen are the major component of the CF and CH feedstock compositions. Both of CF and CH feedstocks contained very low percentage of sulfur, 0.77% and 0.33%, respectively. TGA analysis indicated that coconut wastes are easily degraded. It may be due to their high volatile content. Between the temperature ranges of 300 and 800 °C, the TGA curves showed that the weight percentage of CF feedstock is lower than CH feedstock by 0.62%-5.88%. From the D TGA curves, most of the weight loss occurred between 210 and 400 °C for both feedstocks. The maximum weight loss for both CF and CH are 0.0074 wt%/min and 0.0061 wt%/min, respectively, which occurred at 324.5 °C. The yield percentage of both CF and CH biochars decreased significantly as the pyrolysis temperature was increased. For CF biochar, the yield decreased from 49.40 wt% to 28.12 wt% as the temperature increased from 300 to 700 °C. The yield for CH biochars also decreased from 52.18 wt% to 28.72 wt%. The findings of this study indicated that both CF and CH are suitable feedstock for slow pyrolysis of biochar.

**Keywords :** biochar, biomass, coconut wastes, slow pyrolysis
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