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## PHYSICO-CHEMICAL CHARACTERIZATION OF DIFFERENT AGRICULTURAL RESIDUES IN MALAYSIA FOR BIO CHAR PRODUCTION

Anwar Ameen Hezam Saeed <sup>(1)</sup> Noorfidza Yub Harun <sup>(2)\*</sup> Mohamed Mahmoud Nasef <sup>(3)</sup>

<sup>(1)</sup> Department of Chemical Engineering, Universiti Teknologi PETRONAS, Perak Darul Ridzua, Malaysia.

<sup>(2)</sup> Senior lecturer and Supervisor, Department of Chemical Engineering, Universiti Teknologi PETRONAS, Perak Darul Ridzua, Malaysia.

<sup>(3)</sup> Department of Chemical Engineering, Universiti Teknologi PETRONAS, Perak Darul Ridzua, Malaysia.

### Abstract

*Biomass materials are effective raw materials for biochar production. The conversion of biomass materials to biochar can be primarily converted by both thermochemical and direct combustion methods. Understanding the nature of these biomass components is important for the overall efficiency of the process of converting biomass materials to the desired biochar. The objective of this research is to perform physiological and chemical characterization of prevalent agricultural residues in Malaysia. The physical and chemical characteristics of biomass samples were analyzed using CHNS, TGA, FTIR, XRF and XRD analysis. The thermal degradation behavior in inert environment of rice husk, coconut coir and Kenaf collected locally were studied. The samples with particle size range between 0.5 to 1 mm were subjected to thermogravimetric analyzer (TGA) from room temperature to 650 °C under a nitrogen atmosphere at constant heating rate of 20 °C /min. Among all the samples, rice husk showed the highest silica content of 82.50%, while the coconut coir showed the highest content of lignin, making it the most effective raw material to produce biochar. Elemental analysis showed that Kenaf had the highest ash content (16.3%), while coconut coir had the lowest ash content (9.3%). Thermogravimetric analysis (TGA) result for all samples have presented into three degradation stages: moisture release, hemicellulose-cellulose degradation, and lignin degradation. The results showed that in the first stage of moisture release, all biomass samples degraded between 30 and 150 °C. Kenaf showed the highest mass loss (65%), while rice husk showed the lowest mass loss (45%) in the second stage of hemicellulose cellulose degradation. The lignin in all biomass samples gradually degraded from 370 °C to 650 °C in the third region (lignin degradation). This study provides an important basis for understanding the underlying thermochemistry behind degradation reactions.*

### Author Keywords

Biochar, Characterization, Lignin, Rice husk, Kenaf core, Coconut coir, Silica, Thermal analysis

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