**Thermo-physical, Chemical and Structural Modifications in Torrefied Biomass Residues**

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**Abstract**

The study examined the modifications in the thermo-physical and chemical structure of *Tectona grandis* (TK) and *Sorghum bicolour* stalk residues that occurred during the process of torrefaction. The analytical techniques used are Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA) alongside some basic data characterisation techniques. Data from specific FTIR spectra were used quantitatively in the evaluation of total crystalline and lateral order indices (TCI and LOI) for cellulose and syringyl to guaiacyl (S/G) ratio in lignin. The indices and the ratio were applied in monitoring modifications in cellulose crystallinity and lignin structure. The S/G ratio for untreated TK dropped significantly from 0.6 to 0.12 after torrefaction. An appreciable rise in the TCI and LOI was observed for both samples following the thermochemical conversion process. A distinct thermal decomposition pathway, which widen in discrepancy with increasing torrefaction temperature, was established between untreated and torrefied biomass residues via the TGA. The basic data analysis demonstrated a significant rise in the calorific value of torrefied biomass; approximately from an average of 19.1–26.8 MJ/kg.

**Keywords**

FTIR spectroscopy Torrefied biomass TGA Cellulose crystallinity Calorific value

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**Notes**

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