

## **Physical and thermochemical characterization of Malaysian biomass ashes.**

### **Abstract**

The agriculture sector in Malaysia has been growing rapidly over the years and this leads to large amount of agricultural waste. However, sustainable development and increasing fuel demand necessity had identified biomass ashes can be exploited into many commercial industrial products (i.e. energy, carbon storage, ceramics, construction materials, etc). In this paper, pyrolysis of biomass from four sources (rice husk, palm kernel shell, coconut shell and wood sawdust) has been performed to investigate its correlation with their physical and thermochemical properties in order to exploit their potential application as commercial products in the industry. Generally, biomass ashes have average bulk density between 0.61 and 1.21 gcm<sup>-3</sup> characterised with high porosity (up to 80%) but low thermal conductivity (below 1 W m<sup>-1</sup> K<sup>-1</sup>). Thermogravimetric analysis on the raw biomass revealed that the heating profile of the biomass governed by three major decomposition of hemicellulose, cellulose, and lignin at respective temperatures of 325°C, 375°C, and 400 to 500°C. Inductively coupled plasma (ICP) detected insignificant amounts of toxic metals in the biomass ashes samples. Silica has found to be major compounds in most biomass ashes samples especially rice husk ashes which explain its highest water absorption properties. Other compounds found include calcium, magnesium and potassium. The large variation observed in biomass ashes properties need to be considered when applying these materials to the environmental systems or designing a commercial product, where outcomes may be correlated with these features.

**Keyword:** Biomass ashes; Lignin; Porosity; Spectrometry; Thermal.