

Physico-chemical characterizations of sawdust-derived biochar as potential solid fuels

ABSTRACT

Characterization Malaysian rubber-wood sawdust derived biochar (MRWSB) produced in the fixed bed pyrolysis under different temperatures (450 to 850°C) were studied for its applicability as a solid fuel. A range of analyses were carried out, including biochar oxidation reactivity, inorganic species, oxygen and hydrogen contents in the biochars, release of heteroatoms in biochar as the gaseous product, and biochar structural evolution during pyrolysis process. The results show that the optimum temperature for carbonization to obtain a char having moderately high yield was found as 450 °C. Thermogravimetric analyses (TG) shows that temperatures induces a progressively more ordered carbonaceous structure and leads to a significant changes in the biochar reactivity. The process is coupled with the loss of heteroatoms, released as dominantly carbon dioxide (CO₂) and carbon monoxide (CO). In addition, the elemental study of wood-derived biochar shows the higher carbon content but with low H/C and O/C ratio suggested this material was dominated by highly aromatic structures and this were revealed in the Fourier transform infra-red (FTIR). More importantly, insignificant amount of inorganic species is evidenced in the samples.

Keyword: Biochar; Sawdust; Fixed-bed; Pyrolysis; Combustion; Solid fuels