J Fundam Renewable Energy Appl 2018, Volume: 8
DOI: 10.4172/2090-4541-C1-051

Characterizing selected south western agricultural residuals for metallurgical purpose

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This paper presents some analyses of the characteristics of selected South Western agricultural residuals and recommendations of the residuals as metallurgical fuel based on their characterization. Alternative fuel for cupola furnace in iron melting industries has been a major challenge in Nigeria. The viability of using selected agricultural residuals for iron melting purpose was explored. Samples of wood from Akala, Mahogany, Mansonia, Teak, Ahun, Gmelina and Iroko were sourced from Ado Ekiti, Ekiti State, Nigeria and sun dried for 21 days. The charcoals samples were produced using slow pyrolysis method. The study of the proximate and ultimate analyses of the selected charcoals indicate that all the ash contents of the selected charcoals are within the limit required for Ajaokuta coke (≤13.45 %) and this may result in decreased consumption rate of the selected charcoals and higher efficiency of the metallurgical process. Teak has the least moisture content followed by Akala, Mahogany and Iroko. Teak also has highest calorific value of (27.878 MJ/kg) followed by Mahogany (26.266 MJ/kg), Akala (26.074 MJ/kg) and Iroko (25.951 MJ/kg). The low value of sulphur contents of the selected charcoals may prevent the metal from splitting when forged. The result of analysis of variance showed that there are significant differences in calorific values and moisture contents of the test samples both between and within the seven selected wood species ($p<0.05$). From the analysis, charcoal from Teak is the most preferred for metallurgical purpose followed by Mahogany, Akala and Iroko. The high calorific value of Teak residual may be the probable reason why it is mostly preferred to other available selected species and hence the need for sustainable plantation of this specie of tree in the study area.

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