

Characterization of empty fruit bunch for microwave-assisted pyrolysis

ABSTRACT

Agricultural waste such as oil palm empty fruit bunch (EFB) is of environmental concern to Malaysia as one of the world's largest oil palm producers. Pyrolysis can be used to treat biomass waste due to its flexibility in producing solid, liquid and gas products. This study attempts to characterize EFB for pyrolysis using microwaves as an alternative heating source. EFB taken from a local oil palm mill was subjected to fuel, chemical and dielectric property analysis. The findings revealed that high moisture and 47% oxygen gave low calorific value of 16 MJ/kg. Notably, high water content is an advantage in microwave heating as water is a good microwave absorber, which results in fast drying. Further, a high volatile content at 70% gave the EFB an advantage of high reactivity. A moderate potassium content of 12.8% could also positively affect microwave absorption. The dielectric properties of EFB were observed to be proportional to the moisture content. Furthermore, the microwave penetration depth was found highest at 20% moisture, i.e. 3.5 cm. However, low values of both dielectric constant and loss of dried EFBs would require the addition of microwave absorbers for pyrolysis reaction. The fuel and chemical characteristics of EFB were found comparable to other biomasses, which indicated a good candidate for microwave pyrolysis treatment.

Keyword: Characterization; Empty fruit bunch; Microwave; Pyrolysis