THERMAL DEGRADATION AND KINETIC ANALYSIS ON LEAF BIOMASS OF *Melaleuca cajuputi* Powell (GELAM)

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ABSTRACT

THERMAL DEGRADATION AND KINETIC ANALYSIS ON LEAF BIOMASS OF *Melaleuca cajuputi* Powell (GELAM)

Melaleuca species (Pokok Gelam) are a potential sources of renewable energy, which mostly consists of polysaccharides which can convert to fuels such as bio-ethanol or bio-oil by thermal degradation process. In this research, dried leaves of *Melaleuca cajuputi* Powell were washed with distilled water and shredded into smaller size before dry at room temperature. After drying, it was crushed and grinded into powdered form. In pyrolysis process, *Melaleuca cajuputi* Powell leaf were investigated in a non-isothermal thermogravimetric analyser (TGA) in order to determine the thermal degradation behaviour of dried leaf and Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) analysis was performed to determine possible chemical functional groups in the biomass. There were three stages presence. The first stages involve the degradation of hemicellulose, while the second and third stage involve cellulose and lignin, respectively. The main decomposition of samples occurred between 142.11 to 426.14 °C at heating rate of 10 °C/min, corresponds to the degradation of 75.93% of volatile matter. Weight loss of sample was strongly affected by heating rate. It was found that an increase in heating rate resulted in a shift of thermograms to higher temperatures. From the ATR-FTIR analysis, there were volatile components that found such as H_2O, CH_4, CO_2, and CO. Results showed that *Melaleuca cajuputi* Powell dried leaf can be characterized as high volatile matter and low ash components compared to other biomasses. The apparent activation energy of pyrolysis process was calculated by model free Flynn-Wall-Ozawa (FWO) and Kissinger-Akahira-Sunose (KAS) methods and mean values were 82.04 kJ/mol and 71.34 kJ/mol, respectively. Additionally, it proved that *Melaleuca cajuputi* Powell leaf biomass can become alternative and sustainable energy source.