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Pyrolysis of rice straw by using microwave irradiation with quartz glass reactor

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Abstract. Pyrolysis of rice straw using microwave irradiation with quartz glass reactor has been conducted in a 1 kW domestic microwave system having 2450 MHz frequency. The microwave was modified and was equipped with the cylindrical quartz glass reactor. There are three process parameter studied namely microwave power (watt), the amount of microwave absorber (g), and particle size (µm). The microwave absorber used in this study is char which produced from microwave assisted pyrolysis. From the study, it was found that the addition of microwave absorber had significant effects on the yields and properties of the final products. From the work done, 12.97 % of bio-oil yield was the highest amount of bio-oil produced at microwave power of 500 W, with addition of 0.5 g of microwave absorber (bio char) for the particle size of 125 µm with consistent flow of 5 L/min of nitrogen gas and constant of 10 minutes reaction time. The pH analysis of bio oil was done by using pH meter for randomly selected one reading for each parameter study where the pH of bio oil produced is acidic which is 3.11, 3.18 and 3.86. The bio-oil produced was found to contain important chemical compounds such as cyclohexanol, 2,3-dihydro-1-benzofuran, 2-methoxy-4-vinylphenol and 4-ethylphenol which analyzed by using gas chromatography.

Keywords: Bio-Oil, Char, Microwave Absorber, Microwave Assisted Pyrolysis, Rice Straw