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An Experimental Study on the Torrefaction of Food Waste

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EXTENDED ABSTRACT

Municipal solid waste (MSW) in Malaysia is mainly consist of food waste. As food waste is of organic compounds, its improper management may cause serious environmental issues, as it may produce greenhouse gases and polluting leachate [1]. An alternative management of the food waste is through its utilization. However, the main issue in the utilization of food waste is its heterogeneity, whereby the diversified cooking methods as well as food origin emanates different characteristics [2]. Hence, food waste needs to be pre-treated through the torrefaction process, which is a thermochemical method that converts it to biochar at temperature between 200–300°C in an inert environment [3]. The main aim of this work is to evaluate the feasibility of food waste as a potential source of energy through the torrefaction process. The torrefaction of food waste was conducted in a vertical tubular reactor under inert atmosphere. The effects of various torrefaction temperatures (280°C, 300°C and 320°C); residence times (15 minutes, 30 minutes and 60 minutes) and particle sizes (0.5 mm, 1 mm and >1 mm) were investigated. The results showed that as torrefaction temperature became more severe, a more energy-dense solid fuel with less volatile matter and higher fixed carbon content was produced as shown in Figure 1. The heating values were also increased as shown in Table 1, with increasing degree of torrefaction, which indicates improvement in the heating value potential compared to the raw food waste. These findings imply that food waste may be able to be utilized as a solid biofuel, with fuel properties comparable to conventional fuels.

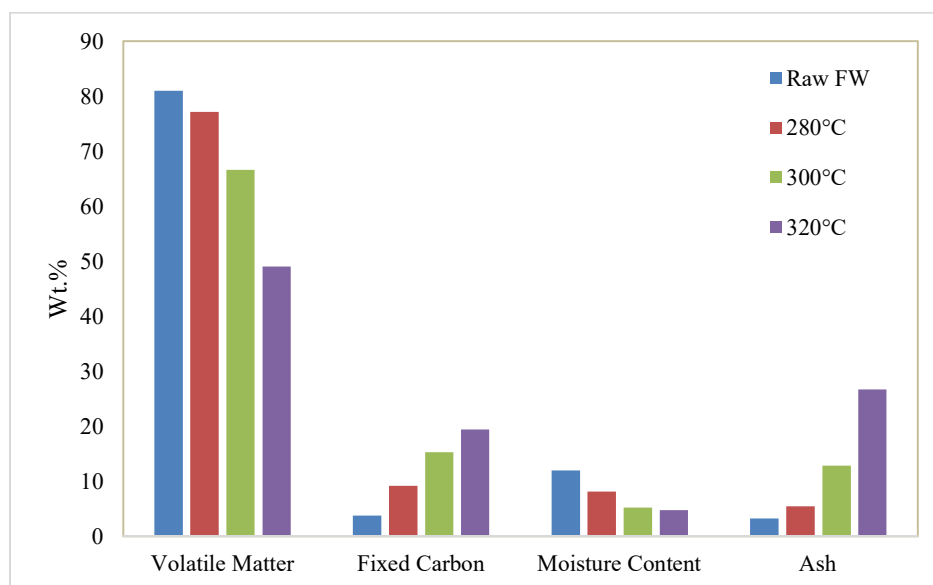


Fig. 1: The effect of temperature on the physical characteristics of the food wastes.

Table 1: The effect of temperature on the higher heating value and the degree of torrefaction of the food wastes.

Temperature (°C)	HHV	Degree of torrefaction
Raw FW	19.63	
280°C	21.82	1.11
300°C	24.35	1.24
320°C	24.45	1.25

Keywords: Food waste; Torrefaction; Biomass; Higher heating value; Degree of torrefaction

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References

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