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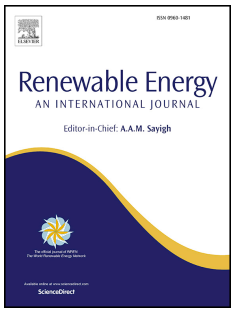

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Torrefaction of Densified Mesocarp Fibre and Palm Kernel Shell

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Abstract

Mesocarp fibre and palm kernel shell (PKS) are widely used as fuels for boilers at palm oil mills to generate electricity. In the present study, the PKS and mesocarp fibre were densified under a controlled condition in prior to torrefaction process. Then, the briquettes were torrefied with various temperatures of 250 to 300℃, residence time of 40 minutes and nitrogen flow rate of 1 l/min. In general, the torrefied mesocarp fibre briquettes were successfully produced regardless of torrefaction temperature, whereas the production of torrefied PKS briquettes was only feasible for torrefaction temperature of 250℃, but the outer surface still remained brittle. The results show that an increase in torrefaction temperature causes a decrease in relaxed density and compressive strength of the torrefied mesocarp fibre briquettes. In terms of combustion properties, an increase in torrefaction temperature causes an increase in gross calorific value, fixed carbon content and ash content while volatile matter decreases. Besides, energy density of the torrefied mesocarp fibre briquettes does not change significantly with respect to the torrefaction temperature. Finally, the gross calorific value and moisture content were found to fulfill the requirements for commercialization as stated by international standards.

Keywords: torrefaction, palm biomass, briquette, mesocarp fibre, palm kernel shell, torrefied briquette.

1. Introduction

The increase in world energy demand, depletion of fossil fuels and awareness of environmental problem have driven transformation towards the dependence on renewable energy sources such as solar, wind and biomass [1]. In the countries where palm trees are widely cultivated such as Indonesia and