

Accepted Manuscript

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PII: S2352-1864(17)30140-2
DOI: <https://doi.org/10.1016/j.eti.2017.09.006>
Reference: ETI 157

To appear in: *Environmental Technology & Innovation*

Received date: 26 April 2017
Revised date: 4 August 2017
Accepted date: 20 September 2017

Please cite this article as: Tan I.A.W., Shafee N.M., Abdullah M.O., Lim L.L.P., Synthesis and characterization of biocoal from *Cymbopogon citrates* residue using microwave-induced torrefaction. *Environmental Technology & Innovation* (2017), <https://doi.org/10.1016/j.eti.2017.09.006>

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**Synthesis and Characterization of Biocoal from *Cymbopogon citrates* Residue using
Microwave-Induced Torrefaction**

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Abstract

This study investigates the effects of microwave-induced torrefaction on the characteristics of lemongrass (*Cymbopogon citrates*) residue. The effects of microwave power level and reaction time on the proximate and elemental contents, surface morphology, surface chemistry, textural properties, thermal stability, higher heating value (HHV), hydrophobicity, and mass and energy yield of the torrefied lemongrass residue were determined. The development of tubular structure on the torrefied lemongrass residue improved its grindability performance. HHV of 19.37 MJ/kg was achieved by lemongrass residue torrefied at 300 °C. The reduction of H/C and O/C ratios were 14.3% and 60.0%, respectively. Mass and energy yield of the torrefied lemongrass residue was 61.20-81.50% and 66.11-83.85%, respectively. The biocoal showed lower moisture absorbing capacity and was less easily to be segregated into fine particles.

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