



## The effect of microwave drying pretreatment on dry torrefaction of agricultural biomasses

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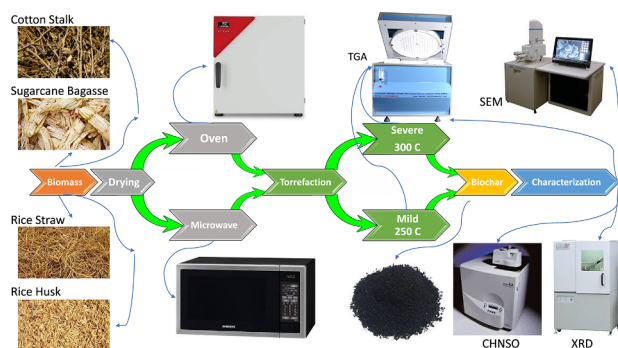
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### GRAPHICAL ABSTRACT



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### ABSTRACT

This paper examines the effect of microwave drying on biomass characteristics and subsequent dry pyrolysis and characteristics of produced biochar from rice straw, sugarcane bagasse, rice husk and cotton stalk compared to oven drying at 105 °C. Dried samples from both methods are torrefied at 250 and 300 °C with 30-minutes residence time. Drying time reached 60 times faster with microwave. The fast and violent microwave drying ruptured the biomasses' surface, releasing more volatiles and having lower crystallinity; these lowered the heating value, energy yield and elemental carbon compared to oven drying except for cotton stalk only due to its woody nature which reduced devolatilization. Sugarcane, rice husk and cotton stalk have the most promising values of elemental carbon, energy yield and heating value reaching that of the bituminous coal. Torrefied rice straw showed high crystallinity of 50.7% while sugarcane and rice husk were completely amorphous.

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