

# Gasification of lignocellulosic biomass to produce syngas in a 50 kW downdraft reactor

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## A B S T R A C T

Lignocellulosic biomass gasification shows a pronounced prospective to replace fossil fuels. In this study, the gasification of coconut shell with charcoal using a 50 kW downdraft reactor was investigated. The controlling parameter of temperature and pressure were used to verify the production of gas during the gasification process with air. The higher contents of cellulose and hemicellulose than lignin in the sample were found to gasify better, as evident from structural analysis. The gasifier produces a combustible gas with a H<sub>2</sub>, CO, CO<sub>2</sub> and CH<sub>4</sub> concentrations of 8.44, 15.38, 5.38 and 1.62 mol.% respectively, at a total flow of air of 30 m<sup>3</sup> h<sup>-1</sup>. The results revealed that 30 wt% charcoal in the feedstock was effectively gasified to generate syngas comprising over 30 mol.% of syngas with a lower heating value of 3.27 MJ/Nm<sup>3</sup>. Thus, the co-gasification of lignocellulosic biomass with charcoal may contribute to affordable and environmentally friendly syngas energy.