

Investigation of co-gasification characteristics of wood-coconut fibers pellet and rice husk mixtures in a downdraft fixed bed gasifier

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Abstrak

Increasing energy demand, in line with the rate of population growth, is always followed by the pace of the waste dump. Where the largest percentage comes from organic waste, it is potentially utilized as raw material of biomass mixture for emission reduction efforts in fuel conversion from waste energy. The main objective of this paper is to study the characteristics of co-gasification, especially gasification temperature, lower heating value and gas emission, on the performance of the biomass gasification process in a downdraft fixed bed gasifier. In this study, organic waste used twigs, coconut fibers and rice husks in the pelletization as raw materials on the combustion technology Downdraft Gasifier. Methods were carried out by co-gasification techniques between WCF (wood-coconut fibers) pellet and rice husk on 100% pellet composition, 75:25, 50:50, 25:75 and 100% rice husk. Syngas testing is done with direct measurement on the burner with TCD type Shimadzu 8A gas chromatography. The highest reactor temperature in the pyrolysis zone was 400oC to 850oC and the temperature in the oxidation zone was 1000oC to 1200oC. The result of the synthetic gas testing obtained the highest lower heating value (LHV) in WCF 100% pellet composition at 4.07 MJ/Nm³ with 85% efficiency. The lower heating value of the lowest syngas in a 100% pellet composition was 2.99 MJ/Nm³, where the increase of WCF pellets will increase the LHV syngas value. This resulted in visually low tar content and low ash particles in all compositions of approximately 30 to 35% of the initial mass of each composition, with the lowest ash in 100% rice husk composition at 0.29 g.