

Gasification of empty fruit bunch for hydrogen rich fuel gas production

ABSTRACT

A study on gasification of Empty Fruit Bunch (EFB), a waste of the palm oil industry is investigated. The composition and particle size distribution of feedstock are determined and the thermal degradation behaviour is analysed by a thermogravimetric analysis (TGA). Then 300 g h⁻¹ fluidized bed bench scale gasification unit is used to investigate the effect of the operating parameters on biomass gasification namely reactor temperature in the range of 700-1000°C and feedstock particle size in the range of 0.3-1.0 mm. The main gas species generated, as identified by a Gas Chromatography (GC), are H₂, CO, CO₂ and CH₄. With temperature increasing from 700 to 1000°C, the total gas yield is enhanced greatly and has reached the maximum value (~ 92 wt. %, on the raw biomass sample basis) at 1000°C with big portions of H₂ (38.02 vol.%) and CO (36.36 vol.%). Feedstock particle size shows some influence on the H₂, CO and CH₄ yields. The feedstock particle size of 0.3 to 0.5 mm, is found to generate a higher H₂ yield (33.12 vol.%) and higher LHV of gas product (17.19 MJ m⁻³).

Keyword: Biomass; Empty fruit bunch; Energy source; Hydrogen; Yield