

Gasification characteristics of biomass/coal blend in a dual circulating fluidized bed reactor

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The effects of reaction temperature (750–900 °C), steam/(biomass or coal) ratio (0.2–0.8) and biomass/blend ratio (0, 0.25, 0.5, 0.75, 1) on gasification characteristics have been determined in a dual circulating fluidized bed reactor (riser: 0.04 m × 0.11 m × 4.5 m-high; gasifier: 0.04 m × 0.285 m × 2.13 m-high).

Sub-bituminous Indonesian tinto coal and *Quercus acutissima* sawdust were chosen as coal and biomass material, respectively. The compositions of the product gas from the steam gasification are H₂ (coal: 31.3–47.2%, biomass: 18.3–26.4%, blend: 20.1–37.5%), CO (coal: 15.6–28.3%, biomass: 32.4–36.2%, blend: 24.5–43.3%), CH₄ (coal: 5.0–8.0%, biomass: 11.4–14.3%, blend: 10.3–18.5), CO₂ (coal: 28.4–34.5%, biomass: 23.5–37.9%, blend: 12.7–33.4%). As the biomass/blend ratio increases, the carbon conversion and cold gas efficiency in the gasifier increase. The calorific values of the product gas are 9.8–11.2 MJ/m³ for the coal, 11.2–13.9 MJ/m³ for the biomass and 12.1–16.4 MJ/m³ for the blend. Compared to other gasifier types, the product gas is the medium calorific value gas since combustion and gasification reactions take place in a separate fluidized bed reactor so that the product gas has no nitrogen dilution.