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Simulation of downdraft gasifier for bioenergy production from coal and biomass: An application of aspin plus

Depletion of natural energy resources and environmental pollution are challenging global issues. Renewable fuels such as solid biomass emerged as a promising candidate to cope with issues of fossil fuels. Gasification is one of popular thermal treatment route to convert biomass into bioenergy at high temperature. Producer gas, biochar, and bio-oil are main products of gasification reaction. Currently, developed technology contributing a significant role in terms of process optimization, process design, product quality and performance enhancement. This work aims to simulate downdraft gasifier to investigate the potential of local coal and wheat straw (biomass) for gas production. Raw samples collected from local market were analyzed. Proximate composition such as, volatile matter, ash, fixed carbon moisture content was found 45%, 9.2%, 45%, 25% and 83.9%, 11.2%,16.2% ,0.60% respectively for coal and biomass. The CO in gas from biomass and coal was found 23.1% and 26.8% respectively in a simulated reactor, while from literature, it was observed 20.3 and 24.5 % respectively. The simulated model was found satisfactory and in a fair agreement with available experimental data in terms of gas composition and performance.

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