

Gasification of Groundnut Shell in an Air Bubbling Fluidized Bed Gasifier

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Abstract : In this work, gasification of groundnut shell was carried out in an air bubbling fluidized bed gasifier. Atmospheric air used as gasification agent in the gasifier. The groundnut shell used for gasification was in powder form and the locally available river sand was used as bed material. Conventional charcoal was used for heating sand bed. Two cyclones were used for proper segregation of char particles and for proper cleaning and cooling the product gas. Experiments were performed on different equivalence ratio (ER) 0.3 - 0.33 by varying feeding rate 36 - 32.8 kg/h of biomass and by keeping the air flow rate constant at bed temperature between 700 °C - 800 °C. Performance of gasifier was evaluated on the basis of different parameters such as cold gas efficiency, carbon conversion efficiency (CCE), Tar and Suspended particles matter (SPM) generation, gas yield, and Higher heating value (HHV) of gas. The optimal ER value for gasification of groundnut shell (GNS) powder in an air bubbling fluidized bed gasifier was found to be 0.31. Cold gas efficiency and CCE value at optimal ER was found to be 63.7 %, and 91 %, respectively. Concentration of Tar and SPM, HHV of gas, and gas yield at optimal ER was found to be 11.88 g/Nm³, 2.38 MJ/Nm³, and 2.01m³/kg, respectively. In the product gas, concentrations of CO, CO₂, CH₄ and H₂ were found to be 12.94%, 13.5%, 5.74% and 13.77%, respectively. At ER 0.31, it was observed that bed temperature of gasifier was in steady state for long time at 714 °C with 5 - 10 °C fluctuation.

Keywords : air bubbling fluidized bed gasifier, groundnut shell powder, equivalence ratio (ER), cold gas efficiency, carbon conversion efficiency (CCE), high heating value (HHV)

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020