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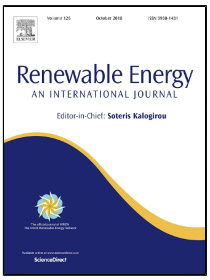

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Improving the properties of producer gas using high temperature gasification of rice husk in a pilot scale fluidized bed gasifier (FBG)

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Abstract

Biomass gasification is a well-studied thermo-chemical conversion route for the generating producer gas, a renewable energy carrier, for thermal and power applications as well as for bio-fuel production. High energy efficiency and clean gaseous fuel with low tar and suspended particulate matters (SPM) contents are some of the major challenges with biomass gasification. Herein, we report non-catalytic high temperature (720-855°C) gasification of rice husk using fluidized bed gasifier (FBG). Producer gas mainly comprising of CO and H_2 exhibited good higher heating value (HHV) and lower heating value (LHV) of 3.6 and 3.2 MJ/Nm^3 respectively. Our experimental observations revealed that 790°C is the optimum temperature for rice husk gasification with high carbon conversion efficiency (91.6%), thermal efficiency (75%) and high gas yield 2.7 m^3/kg. High temperature gasification also resulted into reduced tar+SPM content (0.33 g/Nm^3). Rice husk derived producer gas with good heating value and low tar+SPM content can be used as replacement of conventional fossil fuels for thermal applications in many processing industries.

Keywords: Biomass; Gasification; Producer gas; Tar content; Gas yield; Thermal Efficiency

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1. Introduction

India being an agriculturally rich country the total annual production of agro-residues is around 500-600 million metric ton with net potential of power generation is 18,300 MW [1]. Unfortunately, due to improper handling, processing of biomass and deficient existing technologies lead to un-utilization of surplus biomass to useful energy. In this regard, there is an urgent need of an efficient and clean technology to convert biomass resources to bio-energy.

Recently, advanced thermo-chemical conversion technologies (combustion, pyrolysis and gasification) for bio-energy production have gained tremendous attention in last few decades owing to their lead role in clean and sustainable energy developments [2-3]. Among these