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AN EXPERIMENTAL APPROACH AIMING THE PRODUCTION OF A GAS MIXTURE COMPOSED OF HYDROGEN AND METHANE FROM BIOMASS STEAM GASIFICATION AS NATURAL GAS SUBSTITUTE IN INDUSTRIAL APPLICATIONS

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Abstract

This work presents an experimental approach aiming the production of a gas mixture composed of H_2 and CH_4, which should serve as natural gas substitute in industrial applications. Therefore, a lab-scale process chain employing a water gas shift unit, scrubbing units, and a pressure swing adsorption unit was operated with tar-rich product gas extracted from a commercial dual fluidized bed biomass steam gasification plant. A gas mixture with a volumetric fraction of about 80 % H_2 and 19 % CH_4 and with minor fractions of CO and CO_2 was produced by employing carbon molecular sieve as adsorbent. Moreover, the produced gas mixture had a lower heating value of about 15.5 $\mathrm{MJ \cdot m^{-3}}$ and a lower Wobbe index of about 43.4 $\mathrm{MJ \cdot m^{-3}}$, which is similar to the typical Wobbe index of natural gas.

Keywords: H_2CH_4; hythane; biomass steam gasification; dual fluidized bed; carbon molecular sieve