Experimental Study of Gasification of Argan Nut Shell and Olives Pomace. Syngas Flame Characteristics**

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The main objective of this research is to investigate the gasification in a small downdraft gasifier of argan nut shell and olive pomace biomass. These two biomasses can be intended for combustion or gasification. Argan nut shell is from southwest of Morrocco, while olive pomace waste from the olive oil extraction industry, is from the region of Meknès in Morrocco. The syngas obtained during gasification is conveyed to a coaxial burner placed in a boiler. The syngas emerges through the central tube whose diameter is 20 mm, and the air through the coaxial tube whose diameter is 26 mm. The flame obtained is a syngas/air diffusion flame. The gasifier has an inner diameter of 0.190 m lined with refractory cement and a height of 0.682 m. The throat diameter is 0.047 m. The gasifier and burner are made of stainless steel. Thermocouples Type-K and S were used for recording temperature profiles at different parts of the gasifier (drying, pyrolysis, oxidation, and reduction zones) and at different sections of syngas/air flame. Air flow at the inlet of the gasifier is regulated via a mass flow controller while the syngas is regulated by the high-temperature vortex flow meter. The syngas composition was measured by a gas analyzer. Five gas, CH_4, CO, CO_2, O_2, and H_2 was measured continuously. Physicochemical characterizations of biomass were checked through ultimate and proximate analyses as well as energy content measurement. Ultimate analysis was carried out to determine carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and Sulphur (S) weight fractions. Proximate analysis was done using a thermogravimetric analyzer (DTG-60). A calorimetric bomb (Parr 2100) was used to measure the high heating value (HHV).
In this work, we will compare the performance of olive waste and argan nut shell as fuels for downdraft gasification to reveal the influences of the operating parameters such as reactor temperature and equivalence ratio on the hydrogen-rich-syngas composition. Equilibrium modeling has been used to predict the gasification process in the downdraft gasifier. The effect of initial moisture content in the biomass materials was studied. Finally, a comparison of the equilibrium model will be carried out with the experimental results of gasification.

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