



Comparison of the blending effects of three types of biomasses with low rank lignite on pyrolysis and combustion processes

Arzu Kanca
Ataturk University

Comparison of the blending effects of three types of biomasses with low rank lignite on pyrolysis and combustion processes

Arzu KANCA

Ataturk University, Chemical Engineering Department, 25240, Erzurum, Turkey.

Cotton waste (CW), walnut shell (WS), and hazelnut shell (HS) are three important agricultural residues in Turkey and their utilization for energy production is not common. Compared to these bioresources, lignite is widely used fossil fuel in Turkey due to its abundant amount. However, low calorific value, high ash and sulfur contents of Turkish lignites restrict the lignite utilization in domestic purpose and in power generation. In this study, CW, WS and HS based biomass and lignite based fossil fuel were selected as the main components of mixed energy resources. Pyrolysis and oxidation characteristics of individual biomasses, lignite, and biomass–lignite blends with 50% of mixing ratio are investigated by thermal gravimetric analysis (TGA) equipped with Fourier transform infrared (FTIR) spectrometer. The blending effects of three different types of biomasses on pyrolysis and combustion characteristics of low rank Turkish lignite are compared with respect to thermal decomposition performance and gaseous products emission. The preliminary analysis of the CW, WS, HS, and YC lignite are summarized in the following table.

Table 1. The air dried basis properties of fuels.

| | WS | HS | Lignite | | | |
|-------------------------|-------|-------|---------|--------|--------|--------|
| Moisture (%) | 6.48 | 9.76 | 10.09 | 3.19 | | |
| Volatile (%) | 69.56 | 83.06 | 78.28 | 24.83 | | |
| Ash (%) | 5.93 | 0.56 | 1.16 | 48.38 | | |
| Sulfur (%) | 0.25 | 0.020 | 0.022 | 1.98 | | |
| Heating value (kcal/kg) | | | 3744.5 | 4268.9 | 4386.0 | 3615.0 |

When the low sulfur and ash contents and high calorific value of biomasses are considered, the blending of biomass with high-sulfur lignite may be as an alternative pathway to decrease the sulfur content by preserving the heating value of lignites. The results of the TGA and FTIR analyses revealed that thermal decomposition of low quality lignites can be improved by biomass addition.





CLEAN COAL TECHNOLOGIES 2019
CONFERENCE 3-7 JUNE, HOUSTON

Furthermore, since sulfur emission can be reduced significantly by maintaining the heating values, biomass and lignite blending is promising for the new mixed energy resources.

