

International Congress and Expo on **Biofuels & Bioenergy**

August 25-27, 2015 Valencia, Spain

Burning characteristics of carbonized chars from RDF, scrap tire, and their blends

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Large amounts of garbage are collected in big cities where efficient disposal along with energy recovery is necessary without creating environmental pollution. For this purpose, all of the recyclable materials are sorted and separated from the organic part, and this organic residue known "Refuse Derived Fuel (RDF)" is regarded as renewable and sustainable biomass energy resource. On the other hand, some problematic waste materials such as scrap tires are in huge amounts, and they also must be disposed efficiently by considering their energy potential. In this study, granulated RDF and shredded scrap tire was carbonized in a tube furnace at 600°C under nitrogen atmosphere, and the solid residue (char) was obtained. The parent waste materials and their carbonized chars were characterized by proximate analysis and the calorific value determination. Then, several fuel blends were prepared from both char products. That is, the RDF char was the base ingredient in the blends while the scrap tire char was added to RDF char in the ratios of 5, 10, 15, and 20 wt%. Burning characteristics of the parent samples, char products, and their blends were investigated under dry air flow up to 900°C using a thermal analysis system. DTA (Differential Thermal Analysis), DTG (Derivative Thermogravimetry) and DSC (Differential Scanning Calorimetry) curves were derived from these thermal analysis experiments. Results of this study showed that high quality fuels with high calorific value and low volatile matter content can be obtained by carbonization from RDF and scrap tire. Also, the burning tests indicated that there are serious differences in the burning characteristics of each waste biomass species as well as their chars with respect to the burning rates, onset and end temperatures of burning. Besides, effect of the presence of scrap tire char on the burning characteristics of RDF char was interpreted. Although, scrap tire char was the minor constituent in these char blends, its presence led to important effects on the burning characteristics. Therefore, synergistic interactions or additive behavior was examined to decide which one is more suitable to represent the burning characteristics of these binary char blends.

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