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Gasification characteristics of various biomass on thermal decomposition and steam reforming

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In order to suppress greenhouse gas emission and avoid global warming, utilization of biomass energy as a substitute for fossil fuels has attracted attention in recent years due to its renewability and carbon neutrality. Biomass gasification and pyrolysis has been investigated as one of the technologies for efficiently utilization of biomass energy. However, gasification characteristics of biomass varies according to the types of that. It is necessary to clarify the gasification characteristics of biomass due to practical use of various biomass. Here, the effects of various biomass on gasification behaviors are discussed. In this study, pyrolysis and gasification experiments were carried out using a batch type tubular reactor. Cedar and cypress of coniferous trees, eucalyptus of hardwood and bamboo of grass-type biomass were used as biomass feedstock. These biomass were pulverized and sieved to 0.5 to 1 mm. The sample was put on the ceramics boat and installed in the reactor. The reaction temperature was electrically controlled and set from 600 to 900 °C. The reaction atmosphere was inert only or both inert and steam, and the products were removed from the reactor by carrier gases. The experimental results showed that each biomass species had a different characteristic of gasification. The yields of char produced from the broadleaf eucalyptus and the grass-type biomass bamboo were higher than these of the coniferous wood. This tendency was common in all experimental conditions. The gas yield of bamboo was the lowest result in all biomass feedstocks. For all biomass, on the other hand, the gas yields increased and the tar yields decreased by the addition of steam. Especially improvement of the hydrogen yields was remarkable. It was suggested that steam reforming of the tar was promoted under the atmosphere containing water vapor.

Recent Publications

1. Tian Tian, Qinghai Li, Rong He, Zhongchao Tan, Yanguo Zhang (2017) Effect of biochemical composition on hydorogen production by biomass gasification. International journal of hydrogen energy 42:19723-19732
2. Dangzhen Lv, Minghou Xu, Xiaowei Liu, Zhonghua Zhan, Zhiyuan Li, Hong Yao (2010) Effect of cellulose, lignin, alkali and alkaline earth metallic species on biomass pyrolysis and gasification. Fuel Processing Technology 91:903-909
3. Asri Gani, Ichiro Naruse (2007) Effect of cellulose and lignin content on pyrolysis and combustion characteristics for several types of biomass. Renewable Energy 32:649-661
4. Toshiaki Hanaoka, Seiichi Inoue, Seiji Uno, Tomoko Ogi, Tomoaki Minowa (2005) Effect of woody biomass components on air-steam gasification. Biomass and Bioenergy 28:69-76
5. C. Franco, F. Pinto, I. Gulyurtlu, I. Cabrita (2003) The study of reaction influencing the biomass steam gasification process. Fuel 82:835-842.

Biography

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