

## Waste to Biofuel by Torrefaction Technology

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**Abstract :** Torrefaction is one of waste to energy (WTE) technologies developing in Taiwan recently, which can reduce the moisture and impurities and increase the energy density of biowaste effectively. To understand the torrefaction characteristics of different biowaste and the influences of different torrefaction conditions, four typical biowaste were selected to carry out the torrefaction experiments. The physical and chemical properties of different biowaste prior to and after torrefaction were analyzed and compared. Experimental results show that the contents of elemental carbon and caloric value of the four biowaste were significantly increased after torrefaction. The increase of combustible and caloric value in bamboo was the greatest among the four biowaste. The caloric value of bamboo can be increased from 1526 kcal/kg to 6104 kcal/kg after 300oC and 1 hour torrefaction. The caloric value of torrefied bamboo was almost four times as the original. The increase of elemental carbon content in wood was the greatest (from 41.03% to 75.24%), and the next was bamboo (from 47.07% to 74.63%). The major parameters which affected the caloric value of torrefied biowaste followed the sequence of biowaste kinds, torrefaction time, and torrefaction temperature. The optimal torrefaction conditions of the experiments were bamboo torrefied at 300oC for 3 hours, and the corresponding caloric value of torrefied bamboo was 5953 kcal/kg. This caloric value is similar to that of brown coal or bituminous coal.

**Keywords :** torrefaction, waste to energy, calorie, biofuel

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