

Changes in Physio-chemical Properties of Food Waste during Torrefaction in a Fixed Bed Reactor

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Abstract—This study analyses the physical and thermo chemical properties of sun-dried food waste, before and after torrefaction. Torrefaction has gained popularity in recent times as a pre-treatment technique to improve the physical and thermochemical properties of biomass, however, food waste as a potential biomass for energy purposes has not been explored much. Hence, in this work, we have chosen food waste as biomass for torrefaction study. In this study, torrefaction has been carried out at temperatures of 250°C, 275°C, 300°C and 325°C, for residence times of 10, 20 and 30 minutes in a fixed bed reactor. The solid torrefied products were analysed by proximate analysis, ligno-cellulose analysis, high heating value (HHV) and various process parameters like mass yield, energy yield and energy density. The FTIR analysis was done to determine the chemical composition of the torrefied solid. Mass Spectroscopy was done to analyse the composition of the bottom liquid product from torrefaction. It was found that the food waste underwent several changes in terms of its properties, the most notable being breakdown of ligno-cellulose, loss of moisture and rise in HHV. We concluded the optimum temperature and residence time to carry out torrefaction of food waste to be 325°C and 20 minutes.

Keywords: *Torrefaction, Proximate analysis, Lignocellulosic analysis, Mass spectroscopy, FTIR.*