

Catalytic Pyrolysis of Barley Straw for the Production of Fuels and Chemicals

Authors : Funda Ates

Abstract : Primary energy sources, such as petroleum, coal and natural gas are principle responsible of world's energy consumption. However, the rapid worldwide increase in the depletion of these energy sources is remarkable. In addition to this, they have damaging environmentally effect. Renewable energy sources are capable of providing a considerable fraction of World energy demand in this century. Biomass is one of the most abundant and utilized sources of renewable energy in the world. It can be converted into commercial fuels, suitable to substitute for fossil fuels. A high number of biomass types can be converted through thermochemical processes into solid, liquid or gaseous fuels. Pyrolysis is the thermal decomposition of biomass in the absence of air or oxygen. In this study, barley straw has been investigated as an alternative feedstock to obtain fuels and chemicals via pyrolysis in fixed-bed reactor. The influence of pyrolysis temperature in the range 450-750 °C as well as the catalyst effects on the products was investigated and the obtained results were compared. The results indicated that a maximum oil yield of 20.4% was obtained at a moderate temperature of 550 °C. Oil yield decreased by using catalyst. Pyrolysis oils were examined by using instrumental analysis and GC/MS. Analyses revealed that the pyrolysis oils were chemically very heterogeneous at all temperatures. It was determined that the most abundant compounds composing the bio-oil were phenolics. Catalyst decreased the reaction temperature. Most of the components obtained using a catalyst at moderate temperatures was close to those obtained at high temperatures without using a catalyst. Moreover, the use of a catalyst also decreased the amount of oxygenated compounds produced.

Keywords : Barley straw, pyrolysis, catalyst, phenolics

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