EDITORIAL: Conversion of Biomass into Biofuels with Supercritical Fluids

Today, fossil fuels which cover the majority of our energetic and chemical needs are limited in supply and depleting due to growing trends in energy consumption. Accordingly, researchers are seeking alternative sources that are renewable, sustainable, clean and environmentally friendly. Biomass, as a renewable source, is attracting worldwide attention to meet increasing demands of feedstocks that can be used directly or indirectly in the energy and chemical sector. Biofuels are liquid or gaseous fuels that are produced from biomass for transportation applications. As biofuels are renewable, sustainable, carbon neutral and environmentally friendly, they have been proposed as promising alternative fuels to replace fossil fuels. There has been growing interest on biomass-based biorefineries for developing the processes and technologies for the conversion of biomass to liquid and gaseous fuels and chemicals. There have been tremendous scientific and technological developments in the area in recent years. Thermo-chemical methods of biomass conversion have some advantages over the other methods in terms of feedstock flexibility, lower processing times, complete carbon content utilisation. There are several thermo-chemical methods used to convert biomass into valuable chemicals and useful forms of energy.

Thermochemical liquefaction method is an effective method for converting biomass into bio-fuels. Supercritical fluids are good solvents in liquefaction of biomass due to their unique properties. A supercritical fluid can effuse through solids like a gas, and dissolve materials like a liquid. Supercritical fluids have liquid-like properties such as the lower density of the liquid and gas like properties such as lower viscosity and higher diffusivity. These unique properties make them powerful solvents for mass transfer rates of reactants to biomass molecules and easily penetrate the fibrous solids. They have the ability to dissolve compounds that are not normally soluble in either liquid solvents or gases so that the efficiency of liquefaction reactions can significantly be promoted.

Here, we introduce the valuable papers which involve the conversion of biomass into biofuels with supercritical fluids.

In the paper entitled “Energy production by hydrothermal treatment of liquid and solid waste from industrial olive oil production,” they studied the use of olive oil mill waste treated as subcritical or supercritical water to produce both, a biofuel by liquefaction and a gas fuel by gasification. The results showed the interesting possibility of using olive mill wastewater without a previous drying process to obtain liquid fuel as well as bio-crude.

In the paper entitled “Production and Characterization of Energy Materials with Adsorbent Properties by Hydrothermal Processing of Corn Stover with Subcritical H_2O,” they investigated the effect of temperature on the process performance of hydrothermal processing of corn Stover with subcritical $H_2O$and on the morphology of solid products. The chemical compositions of products in the aqueous phase were determined by GC-MS and HPLC. The solid phase products were characterized by scanning electron microscopy, energy dispersive X-ray spectroscopy, and X-ray diffraction.

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