World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:17, No:07, 2023

Supercritical Hydrothermal and Subcritical Glycolysis Conversion of Biomass Waste to Produce Biofuel and High-Value Products

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Abstract : Raw food waste has a high-water content. If it is incinerated, it will increase the cost of treatment. Therefore, composting or energy is usually used. There are mature technologies for composting food waste. Odor, wastewater, and other problems are serious, but the output of compost products is limited. And bakelite is mainly used in the manufacturing of integrated circuit boards. It is hard to directly recycle and reuse due to its hard structure and also difficult to incinerate and produce air pollutants due to incomplete incineration. In this study, supercritical hydrothermal and subcritical glycolysis thermal conversion technology is used to convert biomass wastes of bakelite and raw kitchen wastes to carbon materials and biofuels. Batch carbonization tests are performed under high temperature and pressure conditions of solvents and different operating conditions, including wet and dry base mixed biomass. This study can be divided into two parts. In the first part, bakelite waste is performed as dry-based industrial waste. And in the second part, raw kitchen wastes (lemon, banana, watermelon, and pineapple peel) are used as wet-based biomass ones. The parameters include reaction temperature, reaction time, mass-to-solvent ratio, and volume filling rates. The yield, conversion, and recovery rates of products (solid, gas, and liquid) are evaluated and discussed. The results explore the benefits of synergistic effects in thermal glycolysis dehydration and carbonization on the yield and recovery rate of solid products. The purpose is to obtain the optimum operating conditions. This technology is a biomass-negative carbon technology (BNCT); if it is combined with carbon capture and storage (BECCS), it can provide a new direction for 2050 net zero carbon dioxide emissions (NZCDE).

Keywords : biochar, raw food waste, bakelite, supercritical hydrothermal, subcritical glycolysis, biofuels
Conference Title : ICBCB 2023 : International Conference on Biomass Conversion and Biochemicals
Conference Location : Vienna, Austria
Conference Dates : July 24-25, 2023