

Microwave pretreatment of residual biomass blends with crude glycerol prior to pyrolysis by means of the GlyCo Bio-Diesel Project concept.

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The purpose of this study is to assess the effect of microwave activation on biomass pyrolysis. In particular, a new pretreatment process to represent the effects of addition of crude glycerol (obtained from biodiesel production unit) to residual biomass, microwave output power and temperature in pyrolyser on the yield of char, bio-oil and syngas is developed.

Transesterification of vegetable oils and animal fats is the most common and widespread method of biodiesel production resulting in a ~10% crude glycerol as the main waste stream or by-product. Crude glycerol is of low value because of the contained impurities. As the demand and production of biodiesel grow exponentially, crude glycerol valorization is mandatory. The production of value-added products emerges as a key management strategy in order to provide an eco-efficient management solution of the biodiesel production plants.

Pyrolysis, is considered to be a sustainable technology practiced for waste management. Particularly in pyrolysis, the advances in heat transfer technology are essential to be optimized, due to large energy consumption. In the recent past, microwave activation has encountered as an excellent prospect in waste management, particularly in pyrolysis, as it encloses a number of advantages over conventional process.

Microwave that propagates through the material, is accompanied in the transport processes resulting in dissipation of electric energy into heat (internal and volumetric). In particular, a new pretreatment process to represent the effects of addition of crude glycerol (obtained from biodiesel production unit) with residual biomass, microwave output power and temperature in pyrolyser on the yield of char, bio-oil and syngas is developed. The ratio of biomass to crude glycerol addition was maintained at 1:4 (crude glycerol: residual biomass) to investigate its effect on the temperature profile on conventional and microwave assisted pyrolysis and product yield. The experiments were performed in batch laboratory scale with a commercial microwave oven operated at a frequency of 2.45 GHz. A comparative analysis of microwave assisted pyrolysis compared with that of the conventional pyrolysis will be performed to indicate the advantages and challenges of the novel process.

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