



NON-THERMAL PLASMA FOR IMPROVED FRACTIONATION OF LIGNOCELLULOSE BIOMASS – DIFFERENT STRATEGIES

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ABSTRACT

Agricultural waste is an emerging environmental pollutant, with a nearly five times higher volume than municipal solid waste. The aim is to develop treatments for fractionation of residues into more uniform streams suitable for biorefineries, by low energy, green treatments. Non-thermal plasma is technology which enables the continuous forming of reactive species through an electrical field at ambient conditions. Thanks to their high reactivity and low selectivity, they are important in combination with chemicals for the conversion of recalcitrant lignocellulose biomass. Ions deriving from acids, alkalis, or inorganic salts are accelerated due to a strong electrical field of cold plasma, and their collision with reactive species provides a synergistic effect. We combined CPT with an alkaline hydrogen peroxide solution and an acidic Fenton reagent for improved delignification and facilitated enzymatic hydrolysis of corn stalks. FTIR and Raman spectroscopy and SEM were used for analysis of chemical and morphological changes in the lignocellulose substrates. Treatments contributed to the improved enzymatic hydrolysis of biomass while enabling valorization of both oxidised lignin and carbohydrate fractions. Residual lignin-rich fractions could be important precursors, e.g. to produce pharmaceuticals and bio-based chemicals, for packaging or suitable for the removal of heavy metals.

Keywords: cold plasma, biomass, processing, biorefinery, agri-food residues

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