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DEVELOPMENT OF INNOVATIVE ALTERNATIVE CROPS FOR THE PRODUCTION OF NATURAL RUBBER

Study of guayule bagasse pyrolysis: Effects of pyrolysis parameters on its heat and mass balance

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The valorization of solid co-products from the exploitation of biomass is proving to be an increasingly important step in the current context of circular economy and eco-efficiency of the use of sustainable natural resources. In this context, the guayule-latex sector generates a significant amount of bagasse (of the order of 80% in dry mass) which needs to be valorized.

A promising technical option currently under study is the transformation of this bagasse into solid fuel (charcoal), liquid fuel (bio-oil) and gas combustible by pyrolysis processes. One of the important issue concerns the mass and energy balances of the pyrolysis transformation; the aim being to optimize the industrial thermochemical process as best as possible by ideally ensuring an energy autonomy of the process.

Thus, the present work aims to establish heat and mass balances of the pyrolysis of bagasse guayule. The pyrolysis was performed under different operating conditions (temperature, heating rate, residence time) to evaluate its effects on the yields and quality of energy vectors mentioned above. The experiments were conducted on a CIRAD laboratory pilot covering the classic pyrolysis conditions encountered at the industrial level in terms of temperature (up to 800 ° C), heating rate (5 ° C / min) and residence time (up to 2 hours). Charcoals, bio-oils and gases were collected and analyzed afterwards. The mass yields of charcoal and bio-oils were determined by weighing. The yield of the pyrolysis gases part was obtained by calculation after determining the composition of the main gas compounds (CO, CO_2, CH_4, H_2) by gas chromatograph.

The heat balances were then determined through calorimetry measurements (higher and ower Heating values) of guayule bagasse, charcoals and bio-oils. The calorific values of pyrolysis gases have been classically calculated from their chemical compositions.

These results are needed in future optimization and scale-up studies of a pyrolysis unit. They will help to predict qualitatively and quantitatively marketable fuel products, mainly charcoal and bio-fuel. These studies will also contribute to the estimation of the possible energy valorization of the pyrolysis gases for the own needs of the pyrolysis process in heat and power.

Topics: guayule
Keywords: Guayule , co-products, bagasse, biochar