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## Hydrothermal carbonization of lignocellulosic biomass for energy production

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Hydrothermal carbonization (HTC) of biomass is a novel thermochemical conversion that improves fuel characteristics of biomass without preliminary drying; the treatment process involves hydrolysis, dehydration and decarboxylation mechanism when raw feedstock is in contact with hot, pressurized water. Solid char, water, water-soluble and gaseous products are produced during the treatment. HTC process was studied using four different biomass feedstocks from Brazil through eucalyptus wood, coffee wood, bamboo and coffee berry parchment. 1 L batch reactor comprised of a stainless-steel tube and connected to two thermocouples, pressure sensor, pressure relief valve and electric heater was used to apply HTC process to a mixed water-biomass feedstock. The effects of the reaction conditions on product compositions and yields were examined by varying the temperature over the range of 180-240°C and varying reaction hold time over the range of 4 hours. Mass and energy yield together with proximate analysis measurement were used for the solid char characterization. The conversion technology brought an increase of the higher heating values up to 28.8, 26, 24.9 and 26.5 MJ•Kg-1 at 240°C for coffee berry parchment, coffee wood, eucalyptus wood and bamboo, respectively, corresponding to an increase of 59, 31, 28 and 36% as compared to those for the raw materials. The reactions of decomposition during HTC resulted in the loss of volatile compounds with a simultaneous increase in the fixed carbon content. Higher temperatures promote more volatiles loses (almost half of the initial values for 240°C temperature treatments). At the same time, the increase of reaction temperature leads to a significant decrease of mass yield on average by 18% at 240°C and slightly descending energy yield with the intensification of carbonization. The work shows and homogeneous product (hydrochar) with the decreased ability of absorbing moisture, due to the decomposition of lignocellulosic components and the decrease of ash content due some part of the ash form minerals that dissolved in the water. Based on these results, HTC is considered to be a potential technology that converts biomass into a value added product with improved fuel properties.

### Biography

Clara L M Martinez has experience in chemical engineering, with emphasis on industrial processes, related to thermal conversion treatments involving biomass, such torrefaction, pyrolysis, gasification, combustion and hydrothermal carbonization. She has been currently working at the Department of Chemical Engineering, Federal University of Minas Gerais, Brazil and Department of Energy Systems, Lappeenranta-Lahti University of Technology, Finland. His/ Her main areas of academic interest are sustainable systems of energy generation through biomass, modeling, simulation and optimization of industrial processes.

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