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Production of bran castor biochar through slow pyrolysis

E. I. Pissinati de Rezende (1,2), A. S. Mangrich (1), M. G. F. Batista (3), J. M. S. Toledo (3), and E. H. Novotny (4)

(1) Federal University of Paraná, Department of Chemistry, Curitiba, Brazil (mangrich@ufpr.br), (2) Federal Technological University of Paraná, Academical Department of Chemistry and Biology, Brazil., (3) Federal University of Paraná, Department of Chemical Engeneering, Curitiba, Brazil., (4) EMBRAPA Solos, Rio de Janeiro, Brazil.

Pyrolysis is a thermal process of great importance in the present context, since it constitutes a significant alternative to adequate use of organic waste. The principal products obtained in the pyrolysis of discarded biomass are bio-oil, biogas and biochar. Biochar, in turn, may play a relevant role when applied to the soil to sequester carbon and as a soil conditioner, a material comparable to organic matter of Indians Black Earths from the Amazon Region [1]. Seeking to determine the best methods of preparation of biochar, we studied the pyrolysis of bran castor residue of the Brazilian biodiesel industry. Eight samples, from FM1 to FM8, were prepared in a factorial design 23 using two temperature (300 and 350 °C), two heating velocity (5 and 10 °C min-1) and two period of heating (30 and 60 min). The eight samples were studied using the spectroscopy: EPR, FTIR, RMN, XPS, and elemental analysis. By elemental analysis, the samples that keep for lower temperature of pyrolysis, 300 °C, showed H/C and N/C ratios greater than the samples of 350 °C. That higher value can be attributed to chemical structure more aliphatic than aromatic mainly in the FM7 sample (V = 10 °C min-1, T = 300 °C, P = 30 min). The greater N/C ratio correlated with a superior amount of nitrogenous functions, presenting by both FM7 and FM4 samples, as determined by 13C NMR spectroscopy with absorptions in 175 ppm (amide) and 55 ppm (N-alkyl).