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Activated carbon and biochar from agricultural by-products in the adorption of Cd, Pb and Zn under laboratory conditions

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The immobilization of inorganic contaminants by using biochar in soils has played an increasingly important role and it is seen as an attractive alternative for the remediation of heavy metals. Although, the production of activated carbon (CA) from agricultural by-products has received special attention, the activation of the the organic source has been studied in order to increase its porposity, surface area and chemical polarity, resulting in higher adsorption of metals. Therefore, this study aimed to evaluate the effectiveness of BC and CA samples, obtained from a eucalyptus husks and cane sugar bagasse after activation with 20% phosphoric acid and pyrolyzed at 450oC in the retention of Zn, Cd and Pb using contaminated individual solutions. The experiment was performed using samples of activated carbon of eucalyptus husk (CCA), eucalyptus husk biochar (BC), activated carbon of sugar cane bagasse (CBA) and sugar cane bagasse biochar (BB), treated with Zn, Cd (range of tested solution from 0.1 up to 12 mmol L-1) and Pb (from 0.1 up 50 mmol L-1) and the adjustemento of Langmuir adsorption isotherms. Samples obtained from bagasse presented higher adsoprtion of the metals tested then eucalyptus. Also the activation process had not the expected effect on either eucalyptus and bagasse samples The maxmum adsorption capacyty of samples were as follws, in mmol g-1: for Cd – 0.36 for BC; 0.32 for CCA; 0.40 for BB; 0.31 for CBA. For Zn– 0.14 for BC; no adsorbed by CCA; 0.35 5 for BB; 0.06 for CBA. For Pb – 1.24 for BC; 0.40 for CCA; 0,45 for BB; 0,03 for CBA. However, it was also observed that due to the activation with phosphoric acid, the pH of the activated carbon (CCA and CBA) were 2.4 and 2.5 in comparison with the biochars not activated (BC and BB) 9.7 and 7.0 respectively. Thus, it is yet not possible to state if the calculate capacity is due exclusively to the complexation of chemical groups in the surface of samples or to which extent there is a contribution of precipitation caused by the basic pH (non-activated) biochar samples, as shown for Zn and Pb.