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Remediation of a contaminated soil by Ni+2 after application of biochar prepared from de-inking paper sludge: Influence on enzyme activities

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In recent years, an increasing proportion of recycled fibres are used in paper industries due to their important environmental and economical benefits. A ton of pulp produced from recycled paper requires 60% less energy to manufacture than a ton of bleached virgin kraft pulp [1]. However, removing the ink, clay, coatings and contaminants from waste paper in order to produce recycled paper creates large amounts of de-inking paper sludge (DPS). Nowadays, more than 200000 t of DPS were produced in Spain. DPS can be used as amendment due to their high organic matter [2] but the high C/N ratio and the heavy metal content can limit its use. For this reason, the preparation of biochar obtained from pyrolysis process for water remediation [3] and soil contaminated by heavy metal can be an valorisation alternative. The main objective of this work is to study the influence of the biochar application prepared from de-inking sewage sludge in the soil enzyme activities of a contaminated soil by Ni+2 at two different concentrations. For this reason, an incubation experiment was performed and several enzymatic activities (dehydrogenase, b-glucosidase, phosphomoesterase and arylsulphatase) were monitored. The study was completed studying the influence of the biochar application in plant-available metals from soil.

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[2] Barriga S., Méndez A., Cámara J., Guerrero F., Gascó G. 2010. Agricultural valorisation of de-inking paper sludge as organic amendment in different soils: Thermal study. Journal of Thermal Analysis and Calorimetry 99: 981–986

[3] Méndez A., Barriga S., Fidalgo J.M., Gascó G. 2009. Adsorbent materials from paper industry waste materials and their use in Cu(II) removal from water. Journal of Hazardous Materials 165: 736–743.