Effects of biochar on remediation of heavy-metals-contaminated soil

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Abstract

Heavy metals are non-biodegradable metals and are considered the main pollutants in soil, which can be transferred to the food chain through crops. Remediation with biochar is an eco-friendly and cost-effective method for soil remediation due to its ability to be produced from renewable biomass and it contains various metals and oxygen-containing functional groups, which can remove the heavy metals from soil through physical sorption, precipitation, complexation, ion exchange, and electrostatic interaction mechanisms. Biochar produced from the pyrolysis of sludge at different temperatures showed that at 900 ◦C, the bioavailable fractions of heavy metals significantly decreased the Cu amount from 91.65 to 9.44 wt%, Zn from 98.82 to 63.34 wt%, As from 97.91 to 52.11 wt%,Pb from 55.91 to 4.87 wt%, Cd from 78.20 to 12.50 wt% and Cr from 73.51 to 9.57 wt%. Two biochar samples produced from the pyrolysis of corn straw and pig manure at 350 ◦C decreased the concentration of Cd, Cr, Hg, and Pb in the soil, especially when combined with a mutant species from *Bacillus subtilis* (B38). Significant decreases in the content of As and Cd were observed by the use of biochar obtained from the pyrolysis of rice straw at 450 ◦C and doped with Fe. Therefore, the addition of biochar to the contaminated soil can be a suitable method to reduce the content of the heavy metals in the contaminated soil.

Keywords: Biochar, contaminated soil, Fe-modified biochar, heavy metals, remediation

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