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Hydrophobic sorption of the soil treated with *giant Miscanthus*-derived biochar as a function of aging period

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Biochar produced from at three different pyrolysis temperatures (400°C, 500°C and 700°C) of giant miscanthus was treated in the ratio of 5% (w/w) in soil (namely, GMC-400, GMC-500, and GMC-700, respectively) and their sorption (kinetics and isotherm) with two hydrophobic model solutes (phenanthrene (PHE) and 9-phenanthrol (9-PTR)) was evaluated as a function of aging periods (0, 3, and 6 months). Physicochemical properties of samples were assessed through the analyses of elemental composition, FT-IR, and SEM. The magnitude of PHE sorption (Kd) by samples was in the order of GMC-500≥GMC-400>>GMC-700. Sorption kinetics of PHE was apparently biphasic and GMC-500 had the largest slow sorption domain. Field aging resulted in the decreased PHE sorption (Kd) over time. Sorption of 9-PTR also decreased over time whereas its hydrophilic sorption increased from 20% up to 30% with aging period. Analyses of FTIR and SEM show that the number of O-containing functional groups increased and the deformation (or blockage) of micropores occurred after 6 months. The aging effect was most apparent for GMC-500. The result of this study strongly supports that giant miscanthus–biochar produced at 500°C is efficient adsorbent for both PHE and 9-PTR, due to its large hydrophobic surface and microporous structure. However, the sample surface became less hydrophobic due to the formation of hydrophilic functional group and the deformation of microporous structure over time due to weathering processes.

Biography

Seunghun Hyun is a Professor in the Department of Environmental Science and Ecological Engineering at Korea University since 2006. He received PhD degree from Purdue University in 2003, and received both BS and MS degrees from Korea University. His expertise is contaminant fate/clean-up in contaminated sites such as abandoned mines, landfills, spilled sites, etc. His recent research project funded by Korean Government is “Assessing long-term fate of heavy metal by understanding non-equilibrium characteristics of natural attenuation process”.

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