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Sorption of nitro explosives to polymer/biomass-derived biochar: Affecting factors and toxicity

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Factors affecting the sorptive removal of nitro explosives [2,4,6-trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)] to polymer/biomass-derived biochar were investigated through batch experiments. Compared to that of rice straw (RS)-derived biochar, the sorption of TNT and RDX to polymer/RS-derived biochar was greatly enhanced by more than 2.5 and 4 times, respectively. The type and amount of polymer did not significantly affect the sorption of nitro explosives to polymer/RS-derived biochar. Due to increasing aromaticity of biochar and decreasing carbon residues from the polymer, the effect of the pyrolysis temperature at elevated temperatures was not marked. Surface treatment with acid or an oxidant did not significantly change the sorption capacity, suggesting that polymer residues may be strongly responsible for the enhancement. Possible polymer residues were identified via GC-MS analysis. The toxicity characteristic leaching procedure (TCLP) and Microtox bioassay analyses indicated that polymer/RS-derived biochar did not show possible harmful effects. Our results suggest that polymer/RS-derived biochar can be effectively used as a sorbent to remove nitro explosives both in the natural environment and engineered systems.

Biography

Seok-Young Oh is a professor of the Department of Civil and Environmental Engineering, University of Ulsan, South Korea. His recent research interests are sustainable energy production, environmental remediation technology, and hazardous waste management. After he received B.S. (1994) and M.S. (1996) degrees from Seoul National University, he obtained a Ph.D. degree from the University of Delaware with a major in environmental engineering in 2003. From 2003 to 2006, he was also working for the University of Delaware as a postdoctoral researcher and a research associate. He has been working as a faculty member for the University of Ulsan since 2007.

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