

Leaching of Mixtures of Biochar and Fly Ash

Anthony V. Palumbo¹, Iris Porat¹, Jana R. Phillips², James E. Amonette³, Meghan M. Drake¹, Steve D. Brown¹, and Christopher W. Schadt¹

¹Biosciences Division, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831. ²Environmental Sciences Division, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831. ³Pacific Northwest National Laboratory, P.O. Box 999, K8-96, Richland, WA 99354.

Keywords: carbon, sequestration, fly ash, Biochar, leaching, metals

There is an increasing interest in the use of biochar (a biomass pyrolysis byproduct) for carbon sequestration. Both biochar and fly ash have potentially beneficial effects on soil properties and on carbon sequestration. We are examining the properties of mixtures of biochar, fly ash, and soil and evaluating leaching of organic carbon and metals from the mixtures. We confirmed that both fly ash and two types of biochar (oak char, and hardwood [HW] char) exhibited minimal leaching of heavy metals. The HW char had a slightly higher C/N ratio (343) and pH (7.7) than did the oak char (287 and 6.5). There was no toxicity exhibited by the fly ash or char leachates as measured by the Microtox[®] assay under the conditions tested. The most notable component in leachate from both types of biochar, but not the fly ash, was organic carbon with the HW biochar leaching less organic carbon than the oak biochar (5.71 ppm vs. 59.3 ppm). Alone (in batch sorption experiments) or in mixtures of 90% soil and 10% biochar (column studies), we noted significant loss of carbon from the biochar into soluble components. However, when we added fly ash to the column experiments (80% soil, 10% fly ash, and 10% biochar), we observed significantly reduced leaching of carbon (20% for HW, and 47% for oak). Thus, applying a combination of fly ash and biochar may result in maximizing the amount of carbon sequestration in soil while also increasing beneficial soil properties and fertility.

Submitted for consideration in the 2009 World of Coal Ash Conference, May 4- 7, 2009.