Evaluation of benzenepolycarboxylic acids (BPCAs) as biomarkers for dissolved pyrogenic organic matter using laboratory-produced and environmentally-aged charcoals

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Pyrogenic organic matter (pyOM), or black carbon (BC), is now recognized for its potential impact on soil chemistry, transport of pollutants and global carbon cycling. Benzene polycarboxylic acids (BPCAs; acid oxidation products of condensed OM) are used as molecular markers for BC, yet we have a poor understanding of the controls on production and fate of dissolved pyOM (pyDOM) and its yield of BPCAs. Here, we report on total C and BPCA compound yields from oak and grass biomass and combustion products, fresh and aged natural charcoals, and their py-DOM leachates and photodegradative products.

PyDOM yield decreased with increasing pyrolysis temperature and increased with environmental aging. BPCA-C was correlated with, but only represented about 6% of leached C. In general, BPCA compound carboxylation increased pyrolysis temperature for both solid chars and their corresponding leachates, reflecting increasing degree of condensation, though this was lower in the leachates. Comparison between BPCA results and chemical information from ^{13}C and ^{1}H NMR and Fourier transform ion cyclotron resonance mass spectrometry (FTICR-MS) will also be presented. Because some char types yield more and different BPCAs than others, use of BPCAs to quantify pyDOM in the environment should be carried out with caution.

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