

Iron Oxide-Mediated Fractionation of Natural Organic Matter (NOM) with Implication for Carbon Stabilization

DINESH ADHIKARI^{1*} AND YU YANG¹

¹Department of Civil and Environmental Engineering,

University of Nevada, Reno

*dadhikari05@gmail.com

Sorption of natural organic matter (NOM) by iron oxide plays a vital role in the stabilization and biogeochemical cycle of carbon. Although many efforts have been made, there is still a big information gap on the fractionation of NOM during the sorption by iron oxide minerals and the impact of NOM fractionation on the carbon stabilization. This study was designed to investigate the governing factors for the sorptive fractionation of NOM with a gradient of hydrophobicity and the influences of NOM fractionation on the carbon stabilization. We have systematically investigated: 1) sorption isotherms for NOMs on iron oxide (Fe_2O_3) under pH of 5-9; 2) chemical fractionation of NOMs upon the sorption by Fe_2O_3 , by applying NMR and FTIR; 3) the impact of NOM fractionation on the reduction release of Fe_2O_3 -associated NOM. So far, we found that the sorption of NOM on Fe_2O_3 increased with the aromaticity of NOM, implying the aromatic carbon-based electron donor-receptor interactions governed the sorptive interactions between NOM and Fe_2O_3 . The fractionation of NOM upon sorption by Fe_2O_3 was regulated by the properties of NOM and aqueous chemistry. For NOM with higher fraction of aromatic carbon, more aromatic fractions of NOM were sorbed by Fe_2O_3 , leaving the residual part more aliphatic. This is inconsistent with general idea that there is a NOM composition-independent trend for its sorptive fractionation. Our results suggest that the fractionation of NOM on iron oxide was regulated by the chemical heterogeneity of NOM and greatly affected the stability of iron-bound carbon.