



ENVR 342: Formation and reactivity of ferrihydrite-organic carbon-calcium co-precipitate complexes

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Complexation with minerals plays a critical role in regulating the stability of soil organic carbon (SOC). The presence of cations was assumed to be important for the complexation between SOC and minerals, but there is still limited direct analysis for the formation and reactivity of SOC-cation-mineral ternary complexes, as well as their influences on the fate of minerals and SOC. This study investigated the formation and reactivity of SOC-calcium (Ca)-ferrihydrite (Fh) ternary complexes using co-precipitates. We found that Ca incorporated into the complex was a function of SOC/iron (Fe) ratio, whereas SOC incorporation was not impacted by the Ca content, implying the formation of Fh-SOC-Ca ternary complexes with SOC as bridges. The presence of Ca also enhanced the incorporation of more aromatic SOC. During the anaerobic Fe reduction by *Shewanella Putrefaciens* CN32, the presence of Ca favored the formation of green rust and decreased the formation of magnetite and siderite in complexes with high SOC content. In complexes with low SOC content, the presence of Ca led to a higher percentage of Fh preservation. Differently, the reduction of Fe and reductive release of Fe-bound SOC were controlled more strongly by the C/Fe ratio, rather than the presence of Ca. After reduction, carboxylic C was enriched in the residual complexes without Ca whereas aromatic C was enriched in the residual complexes with Ca. Phenolic C was missing from all residual complexes. Our results provided novel process-based understanding for the structure and formation of Ca-based ternary complexes, with broader implications for the cycles of metals and

carbon.

Sessions



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Tuesday, Mar 20 2:45 PM

Room 349, Ernest N. Morial Convention Center

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