

The Department of Chemistry and Biochemistry

Seminar Series

Presents a Seminar Titled:

“A Poor Man’s Enzyme: Reactive Manganese Species in the Terrestrial Carbon Cycle”



Presented By

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Soils are the largest and most dynamic terrestrial carbon (C) pool, storing a total of 3000 Pg of C - more than the atmosphere and biosphere combined. Because C oxidation regulates the amount of carbon that is either stored in the soil or emitted as climate-active CO₂, its rate directly impacts the global C cycle. Even a small increase in soil C oxidation rates may thus cause negative feedbacks to the climate system. Yet, uncertainty persists over the enzymatic and geochemical mechanisms controlling C oxidation rates in soils. Recently, however, a strong correlation between oxidation rates and manganese (Mn) content has been observed in soils globally, leading researchers conclude that Mn “is the single main factor governing” the oxidation of C. In this presentation I will show that dissolved Mn(III), one of the most potent yet largely overlooked oxidant in environment systems, is a critical drivers of C oxidation in soils. Specifically, I will discuss the use of X-ray (micro)spectroscopic and voltammetric approaches in determining (i) microbially influenced geochemical reactions creating Mn(III)-based oxidants and (ii) Mn(III)-mediated depolymerization and oxidation reactions of natural biomacromolecules. Our results provide the mechanistic basis for the highly significant “Mn-dependence” of C oxidation in soils and are expected to vastly improve accuracy in predicting environmental and human impacts on CO₂ emissions from terrestrial ecosystems.

Friday, October 27, 2017 at 2:00 p.m. in OCNPS 200