



Fundamental for Life: Soil, Crop, & Environmental Sciences

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348-3 An In Situ Real-Time Quick X-Ray Absorption Spectroscopic (Q-XAS) Investigation of Ni Precipitation On Al-Rich Soil Minerals.

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Henry Gonzalez Convention Center, Hall C, Street Level

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Soil chemical processes are time-dependent, occurring from micro- and milli-seconds for ion association, ion exchange, and some sorption reactions to years for mineral crystallization reactions. Several transition metals commonly found in industrially polluted soils (e.g., Co, Ni and Zn) have been shown to form mixed metal (Me) hydroxide surface precipitates (i.e., Me/Al layered double hydroxides; e.g., Ni/Al LDH) with Al-rich soil minerals on a time scale of several minutes to several hours, depending on the sorbent. These precipitates are environmentally important because they remove metals from the soil solution sequestering them and preventing further transport.

We employed Q-XAS at beamline X18B at the National Synchrotron Light Source to collect Ni K-edge extended X-ray absorption fine structure spectroscopic data to characterize the mechanisms of Ni precipitation and formation of mixed metal Ni/Al LDH phases in real time. This study employed a novel flow-cell to study the kinetics of Ni precipitation. Collecting effluent data concomitantly with Q-XAS data addresses three previously limiting factors: 1) removing the non-sorbed products from the reaction, 2) obtaining *in-situ* kinetic data on real-time formation of LDH precipitates, and 3) measuring Al dissolution during LDH formation. Identifying precipitate formation mechanisms are critical for understanding why these compounds form in the environment and for providing valuable information for modeling and predicting the fate of metals in the environment.

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