

Sediment Depth Profile of In-Situ Anion (NO_3^- and PO_4^{3-}) Assisted Attenuated Remediation of Halogenated Hydrocarbons

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Project Location:

Roger Williams University

Project Description:

Segmented, Rhizon filtered sediment core interstitial pore water are be characterized to elucidate natural biotic and abiotic attenuated remediation degradation pathways of halo-carbons (HCs). This work has important implications from both a climate perspective and for what it tells us about the HCs biogeochemical cycling and their release into the ecosystem. Comparative solvent solid phase extraction techniques; Soxhlet and microwave protocols of whole wet sediments are to be investigated by GC/MS to determine the volatile and semi-volatile array of organics present to infer the chemistry of the environment. Sediment efficacy of HCs transformative potential of autoclaved to oven dried samples are compared deriving *in-situ* abiotic or biotic pathways by HPLC-IC GC/MS headspace and $^{13}\text{C}_2$ NMR. The mechanistic HCs degradation pathway can be confounded by oxidation-reduction potential (ORP) of the environment and its pH, clarifying in-situ metal oxidation states and the potential microbial consortia activity. Catabolic oxidants and the bacterial succession order, following the submergence of sediment pore water, directly matches the order of decreasing potential for the corresponding redox posing (NO_3^- and NO_2^-) couples. Measuring a site's in-situ capacity (soil/water) for transformation directly by treating it with a ^{13}C labeled HC substrate that is capable of undergoing the fundamental processes of oxidation, reduction, and substitution allows the chemistry that occurs to characterize the site. Both the nature and rates of these transformations can be assessed utilizing carbon labeled $^{13}\text{C}_2$ substrates, ^{13}C nuclear magnetic resonance spectroscopy analysis and head space gas chromatography/mass spectroscopy.

*This project involves **primarily lab or computer work***

Required/preferred skills for student applicant:

Completion of Organic Chemistry sequence and Analytical courses

Student transportation needed for project?

No