# Using X-ray Microprobe Techniques to Examine Coupled Biogeochemical-Hydrologic Processes Responsible for Contaminant Mobilization and Retention in Soils and Sediments

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Soils and sediments are structured geomedia that possess intricate interfaces between various solids, solutions, gases, and living organisms. Coupled (bio)geochemical-hydrologic processes transpiring at microscopic scales within these systems control the fate and transport of contaminants, nutrients and other elements of interest; however, it is often difficult to examine and decipher these processes owing to challenges associated with analyzing these complex mixtures. Nevertheless, synchrotron-based x-ray microprobe techniques are capable of providing detailed information—often non-destructively—on the spatial distribution and chemical speciation of elements within soils and sediments. X-ray spot sizes of less than 2 microns, and energies spanning a wide range of element K and L edges allow for detailed chemical analysis across small spatial domains. Here we will present multiple examples demonstrating the efficacy of these techniques for illuminating (bio)geochemical processes responsible for the retention and mobilization of elements within soils and sediments.