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Remote Sensing of Subsurface Microbial Transformations

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Understanding how microorganisms influence the physical and chemical properties of the subsurface is hindered by our inability to detect microbial dynamics in real time with high spatial resolution. We have used non-invasive geophysical methods to monitor biomineralization and related processes during conditions of biostimulation. Alterations in saturated sediment characteristics resulting from microbe-mediated transformations were concomitant with changes in complex resistivity, spontaneous potential, and acoustic wave propagation signatures. Geophysical data were used to image the distribution of mineral precipitates, biomass, and biogeochemical fronts evolving over time. These results enable remote monitoring of contaminated aquifers during and after bioremediation to ensure the effectiveness and stability of treatment strategies.