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Effect of long-term electrodynamic soil remediation on Pb removal and soil weathering

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Highlights

- Full acidification can be obtained during prolonged electrodynamic treatment.
- Redistribution of Pb from the non-acid extractable fraction occurs.
- Ca, Mg and K are dissolved and transported out of the soil to a significant extent.
- Limited dissolution and transport of Al and Si occurs.
- Historic observations from pure clay studies support present findings.

Abstract

Weathering of soil minerals during long-term electrochemical soil remediation was evaluated for two different soils: an industrially Pb contaminated soil with high carbonate content and an unpolluted soil with low carbonate content. A constant current of 5 mA was applied for 842 days, and sampling was made 22 times during the treatment. The overall qualitative mineral composition was unaffected by electrodynamic, except for calcite removal which was complete. However, dissolution and removal of Al, Fe, Si, Mg, Ca and Pb from the soil during the treatment exceeded the fraction extractable by digestion in 7 M HNO₃, and provided evidence of enhanced mineral dissolution induced by the current. Nevertheless, the total dissolved Si and Al only constituted 0.2-0.3 % and 1.1-3.5 % of the total content, while the Pb overall removal from the contaminated soil was only 8.1 %. An observed reduction in the dry matter of 4.5 % and 13.5 % from the two soils, respectively was mainly due to dissolution of CaCO₃ and organic matter, but also included a minor dissolution of other soil minerals.

Key words: Minerals, Soil, Weathering, Pb, Electrokinetics.

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