

Electrokinetic Remediation of Arsenic in a Gold Tailing Studied by *in situ* EXAFS

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Abstract

The tailings of arsenic-containing gold ores have caused a serious environmental problem in the north of Taiwan. Electrokinetic remediation (EKR) is one of the feasible methods for *in situ* soil decontamination. Although EKR has been proven to be very feasible in laboratory- and bench-scale experiments and small-scale field tests, an understanding of the complex arsenic involved in the EKR is of great importance. Thus, the main objective of this work was to track the fate of arsenic in the gold tailing by *in situ* EXAFS spectroscopy. By XRD, it is clear that As₂O₃ is the main arsenic compound in the gold tailing. After EKR, the arsenic concentration near the anode is greater than that near the cathode in the arsenic-containing tailing. The first derivative feature of XANES spectra appeared at 11870 eV indicates the existence of As₂O₃ that is the main arsenic compound in the arsenic-containing gold tailing. Prolonging the EKR contact time to 90 min, the bond distances of As-O (1st shell) and As-As (2nd shell) are increased slightly, that is attributed to the perturbation by the electric field. Note that the dissolved H₂AsO₃⁻ is accumulated near the anode. The amount of As₂O₃ (dissolved as H₂AsO₃⁻) in the tailing is increased significantly after EKR for 60 min. However, when the EKR time was prolonged to 90 minutes, the amount of H₂AsO₃⁻ is decreased, suggesting the migration of arsenic to the anode and eventually accumulated near the anode. This work illustrates the usefulness of EXAFS and XANES for revealing speciation of arsenic embedded in the complex matrix of a gold tailing in the EKR process.

Keywords: Arsenic, electrokinetic remediation, *in situ* EXAFS, XANES, gold tailing.

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