Electrokinetic remediation of copper mine tailings: Implementing bipolar electrodes

Important process parameters to optimize in electrokinetic soil remediation are those influencing remediation time and power consumption since these directly affect the cost of a remediation action. This work shows how the electrokinetic remediation (EKR) process could be improved by implementing bipolar electrodes in the porous material. The bipolar electrodes in EKR meant two improvements: (1) a shorter migration pathway for the contaminant, and (2) an increased electrical conductivity in the remediation system. All together the remediation proceeded faster with lower electrical resistance than in similar experiments but without the bipolar electrodes. The new electrokinetic remediation design was tested on copper mine tailings with different applied electric fields, remediation times and pre-treatment. The results showed that the copper removal was increased from 8% (applying 20V for 8 days in sulphuric acidified tailings) without bipolar electrodes to 42% when bipolar electrodes were implemented. Furthermore, the results showed that in this system sulphuric acid addition prior to remediation was better than citric acid addition. In addition, applying a too strong electric field (even with bipolar electrodes) could cause a severe polarization (e.g. a high electrical resistance) in the remediation system.

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