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Bioleaching of arsenic in contaminated soil using metal-reducing bacteria

So-Ra Lee (1), Jong-Un Lee (2), and Hyo-Taek Chon (3)

(1) Korea Institute of Energy Technology Evaluation and Planning(KETEP), Gangnam-gu, Seoul 135-502, Korea. , (2) Department of Energy and Resources Engineering, College of Engineering, Chonnam National University, Gwangju 500-757, Korea. , (3) Department of Energy Resources Engineering, College of Engineering, Seoul National University, Seoul 151-744, Korea, (chon@snu.ac.kr)

A study on the extraction of arsenic in the contaminated soil collected from an old smelting site in Korea was carried out using metal-reducing bacteria. Two types of batch-type experiments, biostimulation and bioaugmentation, were conducted for 28 days under anaerobic conditions. The biostimulation experiments were performed through activation of indigenous bacteria by supply with glucose or lactate as a carbon source. The contaminated, autoclaved soil was inoculated with metal-reducing bacteria, Shewanella oneidensis MR-1 and S. algae BrY, in the bioaugmentation experiments. The results indicated that the maximum concentration of the extracted As was 11.2 mg/L at 4 days from the onset of the experiment when 20 mM glucose was supplied and the extraction efficiency of As ranged 60∼63% in the biostimulation experiments. In the case of bioaugmentation, the highest dissolved As concentration was 24.4 mg/L at 2 days, though it dramatically decreased over time through re-adsorption onto soil particles. After both treatments, mode of As occurrence in the soil appeared to be changed to readily extractable fractions. This novel technique of bioleaching may be practically applied for remediation of As-contaminated soil after determination of optimum operational conditions such as operation time and proper carbon source and its concentration.