Effect of pulse current on acidification and removal of Cu, Cd, and As during suspended electrodialytic soil remediation - DTU Orbit (09/11/2017)

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The effect of pulse current on the acidification process and the removal of heavy metals during suspended electrodialytic soil remediation were investigated in this work. Eight experiments with constant and pulse current in two polluted soils were conducted using a 3-compartment membrane cell, predominately working under overlimiting current density conditions. Soil 1 was sampled from a pile of excavated soil at a site with mixed industrial pollution (Cu and Cd), and soil 2 was sampled from the top layer of a wood preservation site (Cu and As). Results showed that pulse current improved the acidification by supplying more reactive H^+ ions (defined as the H^+ ions causing release of heavy metals from soil particles). The molar ratio of reactive H^+ ions to total produced H^+ ions (R_{H+}/P_{H+}) was higher in every pulse current experiment than in the corresponding constant current experiment. In addition the removal efficiencies of heavy metals were also improved. The carbonate buffering system in a soil is the first mechanism reacting with the produced H^+ ions and impeding the heavy metal mobilization. It was found that the effect of improvement on both the acidification process and the removal of heavy metals were more significant in the soil with highest buffering capacity than the soil with low. Energy distribution analysis demonstrated that most energy was consumed by the transport of ionic species through the soil suspension, and then followed by membranes and electrolytes. The pulse current decreased the energy consumption to different extent depending on the pulse frequency. The lowest energy consumption was obtained in the experiment with the highest pulse frequency (96 cycles per day) for both soils.

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