Pulse current enhanced electrodialytic soil remediation: Comparison of different pulse frequencies

Energy consumption is an important factor influencing the cost of electrodialytic soil remediation (EDR). It has been indicated that the pulse current (in low frequency range) could decrease the energy consumption during EDR. This work is focused on the comparison of energy saving effect at different pulse frequencies. Based on the restoration of equilibrium, the relaxation process of the soil-water system was investigated by chronopotentiometric analysis to find the optimal relaxation time for energy saving. Results showed that the pulse current decreased the energy consumption with different extent depending on the pulse frequency. The experiment with the frequency of 16 cycles per day showed the best restoration of equilibrium and lowest energy consumption. The energy consumption per removed heavy metals was lower in pulse current experiments than constant current and increased with the pulse frequency. It was found that the transportation of cations through the cation exchange membrane was the rate controlling step both in constant and pulse current experiments, thus responsible for the major energy consumption. Substitution of the cation exchange membrane with filter paper resulted in a dramatic decrease in energy consumption, but this change impeded the acidification process and thus the removal of heavy metals decreased significantly. (C) 2012 Elsevier B.V. All rights reserved.