Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2018.22929

127 (2018) 178–183
September

Groundwater treatment by electrodialysis: gearing up toward green technology

Rose Marie O. Mendoza[a], Maria Lourdes P. Dalida[b], Chi-Chuan Kan[c], Meng-Wei Wan[d,*]

[a]*General Education Department, Far Eastern University-Nicanor Reyes Medical Foundation, Fairview, Quezon City, Philippines, Tel. +639988843968; emails: rosey1926@gmail.com; rmomendoza@feu-nrmf.ph*
[b]*National Graduate School of Engineering, Department of Chemical Engineering, University of the Philippines, Diliman, Quezon City, Tel. +6329296640; email: mpdalida@gmail.com*
[c]*Institute of Hot Spring Industry, Chia Nan University of Pharmacy and Science, Tainan 71710, Taiwan, email: cckanev@mail.cnu.edu.tw*
[d]*Department of Environmental Resources Management, Chia Nan University of Pharmacy and Science, Tainan 71710, Taiwan, Tel. +88662660615; email: peterwan@mail.cnu.edu.tw*

Received 1 February 2018; Accepted 6 August 2018

ABSTRACT

The performance of a tailor-made electrodialysis stack to treat groundwater was conducted and evaluated. The stack was operated at optimum experimental conditions at applied voltage of 17 V, feed flow velocity of 0.033 L/s, and desalination time of 92 min. Major cation contents of the groundwater were Na, K, Ca, Mg, and As, and anions identified were Cl, NO_3, SO_4, HCO_3, and PO_4. The average cation and anion removal efficiency were 99.15% and 100%, respectively. The oxidation-reduction potential was also recorded to increase from –162.2 to 908 mV, indicating a shift from a highly reducing to a highly oxidizing reaction. Solution pH was also noted to drop from 7.62 to 5.80 with corresponding decrease in the conductivity of 1,388–36 μS/cm. The product water can be classified as that of purified water and suitable for drinking and analytical purposes. Arsenic desalination kinetics was found to increase overtime at constant applied voltage and feed flow rate. Lower As feed concentration samples tend to achieve product water concentrations with maximum contaminant level lower than 10 ppb earlier than high feed concentration samples.

Keywords: Electrodialysis; Groundwater treatment; Removal efficiency; Green technology; Sustainable environment

* Corresponding author.

Presented at the 15th International Conference on Environmental Science and Technology (CEST-2017), 31 August – 2 September 2017, Rhodes, Greece