Abstract No: 76

Earth & Environmental Sciences

MITIGATION OF HIGH TDS WATER WITH ELECTRODIALYSIS REVERSAL METHOD – AN ALTERNATIVE SOLUTION FOR DRY ZONE WATER PROBLEM IN SRI LANKA

J.U. Halpegama[1*], P. Rukshagini[1], B. Tian[2], A.C. Herath[3], S.K. Weeragoda[4], Y. Wei[2] and R. Weerasooriya[1]

[1]National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka
[2]Research Center for Eco–Environmental Sciences, Chinese Academy of Sciences, Beijing, 100085, People's Republic of China
[3]Department of Physical Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, Sri Lanka
[4]National Water Supply and Drainage Board, Katugastota, Kandy, Sri Lanka
[*]jhalpegama@gmail.com

High TDS groundwater sources are ubiquitous in the dry zone. However, the WHO or other regulatory agencies, do not list TDS as a primary drinking water standard; hence, its regulation is not mandatory. The mitigation of TDS in water is commonly carried out by Reverse Osmosis and nanotechnology treatment methods. However, groundwater in the dry zone rarely exceeds TDS > 5000 mg/L which renders that direct importation of RO methods are not suitable. In this research, based on the source water quality, EDR performance was optimized. However, the parameter optimization to a given water source remains as a challenge. JR-EDR laboratory equipment was used in this study. The EDR cell was constructed using Ti-RuO_2 electrodes and Tingrum JCM – II + JAM – II intra phase ion exchange membrane. EDR operation was performed on water collected from a tube well at the Faculty of Applied Sciences, Rajarata University of Sri Lanka. Tube well rock hole is with 6 inches in diameter, 10.25 to 40.00 m in depth and 4.03 m below ground level for the static water level. The heterogeneous aquifer is composed of quartz (38.56 %), albite (16.73%), orthoclase (8.1%), anerite (1.51%), and muscovite (2.84%). To reduce turbidity, sand and activated carbon filters were used before EDR treatment. The input current was varied from 0.5 - 3.0 A, and the flow rate adjusted to 5.25 mL min^{-1}. According to the results obtained, 40 W power was recommended for its highest performance. It was found that 23.07% current efficiency, 53.33 kWh m^{-3} energy consumption, 87.3% system desalination efficiency calculated based on conductivity measurement, 57.98% treated water recovery, 88.57% removal of TDS and 56.23% of water rejection. The composition of the treated and concentrates are pH 6.4, 7.5 EC 90, 1050 TDS 40, 510 respectively. The results show that a thorough assessment of source water quality and parameter optimizations are essential for efficient use of EDR technology to the villages of Sri Lanka.

Financial assistance from National Research Council (Grant No: NRC-TO-16-015) is acknowledged.

Keywords: Current efficiency, Electrodialysis, Energy consumption, Water quality