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Storable Hydrogen Production by Reverse Electro-Electrodialysis (REED)

Xia Chen[a,b,1], Chenxiao Jiang[a,1], Yilue Zhang[a], Yaoming Wang[a] and Tongwen Xu[a]*

[a] *CAS Key Laboratory of Soft Matter Chemistry, Collaborative Innovation Center of Chemistry for Energy Materials, School of Chemistry and Materials Science, University of Science and Technology of China, Hefei, Anhui 230026, People's Republic of China*

[b] *School of Materials and Chemical Engineering, Anhui Jianzhu University, Hefei, Anhui 230026*

***Abstract*:**

Reverse electrodialysis (RED) as an emerging technology to generate electric power through two different salinity solutions, has deserved full attention in the past decade. Nevertheless, the current generated by the RED may not match the power network and hinder its development. In this work, a novel method called Reverse Electro-Electrodialysis (REED) system was firstly proposed as a method for pure and storable hydrogen production as alternative. Instead of the conventional reversible redox couples, hydrochloric acid and sodium hydroxide are used respectively as cathode solution and anode solution to reduce hydrogen evolution potential. The performance on energy recovery and H_2 production was evaluated by changing ΔC (solution salinity difference). A mathematical model derivate from Nernst–Planck equation was established to correlate the acidic catholyte concentration with electrochemical effect. The results indicate that H_2 production is highly dependent on the current density and the electrode solution's concentration, i.e. the salinity gradient and hydrogen evolution over-potential. A good matching was found between predictions and experiment results.

***Keywords*:** Salinity power; Reverse Electro-Electrodialysis; hydrogen energy;

[1]These authors contributed equally to the work.

*Corresponding author. *E-mail: twxu@ustc.edu.cn*