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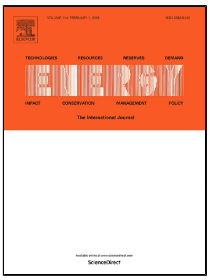

Reverse electrodialysis: modelling and performance analysis based on multi-objective optimization

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Reverse electrodialysis: modelling and performance analysis based on multi-objective optimization

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Abstract

In this paper, we proposed a refined model to describe the RED process by considering the variation of flow rates along the flow direction, and the concentration depended density and viscosity. The model was verified by good accordance between the calculated and experimental measured data. For evaluating the performance of a RED stack for some special applications, the net power density and the energy efficiency are two main criteria. However, they could not achieve their maximum values simultaneously. To achieve such a compromise, an optimization based on Non-dominated Sorting Genetic Algorithm II (NSGA-II) was conducted. Besides, the net power output and energy efficiency under single-objective optimization methods were calculated and compared. Results revealed that compared to the results under the maximum net power density, the net power density under the multi-objective optimization is slightly less than the maximum one, meanwhile the energy efficiency was much greater. The performance under the multi-objective optimization exhibited no obvious disadvantage against that under the maximum energy efficiency, considering the significant increase of the net power density.

Keywords: Reverse electrodialysis (RED); Modeling; multi-objective optimization; Power density; Energy efficiency