NUMERICAL SIMULATION OF REVERSE ELECTRODIALYSIS WITH AMMONIUM BICARBONATE

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A closed-loop reverse electrodialysis (RED) system using thermolytic solution has drawn significant attention in a low-grade waste heat energy recovery. The closed-loop characteristic enable the system have merits such as no need of repetitive pretreatment cost and removal of locational constraint than open-loop RED with sea and river water. In this study, we presents the numerical simulation of RED using ammonium bicarbonate which is one of the promising solute. The permselectivity of ion exchange membrane was calculated from membrane potential with various concentration ratios. We found that the polarization and the power density curve using the computed permselectivity are similar to the experimental results. The RED performance with ammonium bicarbonate was validated according to various concentration combination and flow rate. The open circuit voltage (OCV) and power density fit well for a wide range of solution concentration and the various flow rate. Finally, the optimum value of net power density, which consider the pumping loss, was obtained in terms of the intermembrane distance and the concentration ratio by the net power density contour.

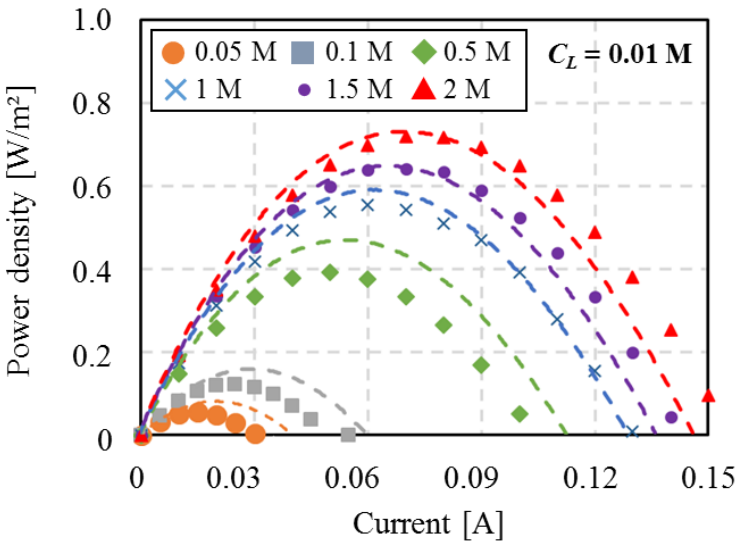

Figure 1 – Comparison of power density curve between the simulated and experimental results. The concentration of the diluted solution is fixed at 0.01 M. The feed flow rate is 10 mL/min for each cell.