Development of a 1D General-purpose Model for Electrochemical Conversion of CO_2 to Chemicals

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Climate change mediated by increased CO_2 concentration in the atmosphere is one of the most significant challenges facing humanity. One of the effective technology to solve this problem is an electrochemical conversion of CO_2 to chemicals. The technology is attracting attention as a way to store excess electricity as well as to curb CO_2 emission. There is a wide range of research to relevant to the electrochemical CO_2 conversion, like electro-catalyst development and electrolyte development. However, to conduct experimental studies is highly time-consuming and expensive. In this study, we develop a 1D general-purpose model for electrochemical CO_2 conversion processes. The model is developed as mathematical equations which describe mass transport, charge conservation, reaction kinetics, and electrochemistry and consists of three sub-models. The modeling results show the steady-state behavior of liquid flow in the electrochemical reactor. Also, the model calculates and predicts the performance of the conversion processes, efficiently. This study shows a 1D general-purpose model for electrochemical CO_2 conversion processes and the model simulation results.