

Liquid kinetics model for the estimation of inorganic carbon composition in algae cultivation system

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Algae biodiesel is a promising renewable energy, but the energy has a long way to go before the optimization for commercialization. In order to optimize the algae cultivation process, an amount of algae growth modeling research have been conducted. In spite of the importance of carbon source for algae growth, however, there is a lack of research to estimate composition of inorganic carbon species in a culture medium. Especially, lots of estimation model have ignored the electrolytic and dynamic properties of culture medium for simplicity. In this research, we suggest a rigorous liquid kinetics model of carbonate electrolyte system for applying to process design and optimization of the algae cultivation system. The model is a rate-based model that estimates the inorganic carbon composition in algae cultivation system in consideration of reactions in aqueous phase and gas-liquid mass transfer between carbon dioxide and medium. Especially, we used thermodynamic activity model in order to reflect non-ideality of the electrolyte system. The performance of the liquid kinetics model was proved from the comparison with ideal estimation model using open literature data.