

Application of the enzymatic fuel cell system using sugars of microalgae

이자현, 김동섭, 이주훈, 이수권¹, 김찬겸, 양지현, 박철환², 김승욱[†]

고려대학교; ¹고려대; ²광운대

(kimsu@korea.ac.kr[†])

Recently efforts to directly convert biomass to electrical energy have been made for future energy source, essentially a biofuel cell. Enzyme fuel cell (EFC) generates electricity from glucoses by using glucose oxidase (GOD) on the anode.

The purpose of this study is to produce power by using microalgae, substrates of enzyme fuel cell containing inedible sugars, and analyze the effects of microalgae on fuel cell. First, in order to extract sugars within microalgae, optimum acid hydrolysis conditions (type of acid, solid-liquid ratio) will be established. The most effective reagent was investigated among the five reagents (hydrochloric acid, nitric acid, phosphoric acid, peracetic acid and sulfuric acid). To obtain high concentration of extracted sugars from microalgae, the reaction conditions of acid hydrolysis were optimized as 100 g/L of solid-liquid ratio, 2% of hydrochloric acid and heated at 121 °C for 15 min. The maximum efficiency of hydrolysis 95.88% was achieved. Finally, the reducing sugars from microalgae was utilized in EFC system and achieved maximum power density of 2694 $\mu\text{W}/\text{cm}^2$.