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Electricity Generation using a Microbial Fuel Cell- An Application to wastewater

폐수를 연료로 작동하는 생물연료전지의 개발

Hyung J. Kim, Moon S. Hyun, Hyung S. Park, Byung W*. Cho, Byung H. Kim

Korea Institute of Science and Technology

Water Environment Research Centre, Chemical Engineering Division*

김형주, 현문식, 박형수, 조병원*, 김병홍

한국과학기술연구원 수질환경연구센터, 화공연구부*

An iron reducing bacterium, *Shewanella putrefaciens* IR-1 was used to construct a novel microbial fuel cell. The bacterium used was electrochemically active in cyclic voltammetry, and produced electricity in a fuel cell without any electrochemical mediators. Graphite felt was used as a suitable electrode. In the open-circuit stage of the fuel cell, the maximum voltage was about 0.7 volt. When the external circuit was completed with a suitable resistor the current output was about 0.2 mA in the presence of lactate as a fuel. The behaviour of the fuel cells operated under the more anaerobic condition responded more rapidly to the addition of fuel than their analogues operated in the normal condition. This result was attributed to an improvement in the kinetics of the direct transport of electron from the bacteria to the anode surface due to the greater exclusion of the electron acceptor such as dissolved oxygen from the anode compartment. When employed in continuous operation, fuel cells were capable of being operated with lactate as a fuel over a period of 30 days without malfunction. Based on these results as a model, a microbial fuel cell was developed to use wastewater from a starch processing plant as a fuel. The maximum potential and current obtained from the fuel cell using the wastewater were 0.66 V and 0.2 mA, respectively. During a given time of operation of the fuel cell, overall 70 % of COD_{cr} of the wastewater was removed, and corresponded amount of electricity was produced.