Optimization of co-culture inoculated microbial fuel cell performance using response surface methodology

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ABSTRACT

Microbial fuel cells (MFCs) are considered as promising technology to achieve simultaneous wastewater treatment and electricity generation. However, operational and technological developments are still required to make it as a sustainable technology. In the present study, response surface methodology (RSM) was used to evaluate the effects of substrate concentration, co-culture composition, pH and time on the performance of co-culture (*Klebsiella variicola* and *Pseudomonas* aeruginosa) inoculated double chamber MFC. From the statistical analysis, it can be seen that the performance of MFC was not influenced by the interaction between the initial COD and time, pH and time, pH and initial COD, time and initial COD. However, the interaction between the inoculum composition and time, pH and the inoculum composition, initial COD and inoculum composition significantly influenced the performance of MFC. Based on the RSM results, best performance (power density and COD removal efficiency) was obtained when the inoculum composition, initial COD, pH and time were about 1:1, 26.690 mg/L, 7.21 and 15.50 days, respectively. The predictions from the model were in close agreement with the experimental results suggesting that the proposed model could adequately represent the actual relationships between the independent variables generating electricity and the COD removal efficiency.

KEYWORDS:

Co-culture inoculum; Design of experiments; Box-behnken design; Mutualistic interactions; Chemical oxygen demand