Quick start-up and high power density of microbial fuel cell with a polydopamine/polypyrrole modified carbon felt

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Microbial fuel cells convert chemical energy directly to electrical energy via electrochemically active microorganisms. Such bacteria exchange respiratory electron with electrode via extracellular electron transfer through biofilm matrix. Therefore, the interaction between microbes and electrode surface is a key factor to increase power density of MFC. In this study, a novel polydopamine/polypyrrole modified carbon felt was developed and applied into MFC. The prepared PDA-PPY-CF presented 500 mW/m2, which was 1.5, 1.15, and 1.13 times greater than those of the unmodified carbon felt, PDA-CF, PPY-CF, respectively. PDA has superior hydrophilicity and adhesive force for biofilm development, while PPY provides electrochemically active sites for electron transfer between biofilm and anode. Results from Fourier Transform Infrared Spectroscopy, Brunauer-Emmett-Teller and Contact angle analysis show increase in the physicochemical properties of PDA/PPY-CF. These results show that modification with PDA/PPY provides excellent electrochemical properties for electrochemically active biofilm for MFC, therefore enhance performance MFC for bioelectricity generation and bioconversion.