Polydopamine/polypyrrole doped graphite felt enhances power density and start-up of microbial fuel cell

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Microbial fuel cells (MFCs) are electrochemical devices that can convert chemical energy directly to electrical energy using the bacteria as bio-electrocatalysts. The interactions between bacteria and the surface of the anode play a key role in capturing the respiratory electrons from bacteria. Therefore, anode performance is a key factor for the power density of MFC. In this study, a novel type of anode was developed by electrodeposition using polydopamine (PDA), polypyrrole (PPY), and Graphite felt (GF). These components and the resulting structure promoted enhancement of biofilm formation, accelerated EET between bacteria and anode surface, gained a high-performance PDA/PPY-GF. The prepared PDA/PPY-GF reached 920mW/m^2, which was 1.5, 1.17, and 1.18 times greater than those of the GF, PDA-GF, PPY-GF, respectively. PDA has superior hydrophilicity and adhesive force for strong interaction with biofilm, and PPY provides electrochemically active sites for electron transfer between biofilm and anode. Overall, these results reveal that modification anodes provide a promising electrocatalyst for high-performance MFC to enhance waste treatment for the purpose of future bioprocesses.