Abstract

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Immobilizing Enzymes on a Commercial Polymer: Performance Analysis of a GOx-Laccase Based Enzymatic Biofuel Cell Assembly

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Abstract

Enzymatic Biofuel Cell (EBC) represents a promising green source since it is capable of harvesting electricity from renewable and abundantly available biofuels using enzymes as catalysts. Nevertheless, nowadays long-term stability and low power output are currently the main concerns. To this end, several research studies focus on using complex tridimensional and highly expensive nanostructures as electrode support for enzymes. This increases cell performance whilst drastically reducing the economic feasibility needed for industrial viability. Thus, this paper analyzes a novel flow-based EBC consisting of covalent immobilized GOx (bioanode) and Laccase (biocathode) on a commercial flat conductive polymer. A suitable immobilization technique based on covalent ligands is carried out to enhance EBC durability. The experimental characterization demonstrates that the cell generates power over three weeks, reaching 590 mV and 2.41 μW cm−2 as maximum open circuit voltage and power density, respectively. The most significant contributions of this configuration are definitely ease of implementation, low cost, high scalability, and reproducibility. Therefore, such a design can be considered a step forward in the viable EBC industrialization process for a wide range of applications

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Biography

Professor Ahmed Hashash has completed his PhD from Manchester University, UK. He is a fellow of the California Institute of Regenerative Medicine (CIRM) and New York University Medical School (MSSM), USA. Prof. Ahmed Hashash worked as a senior biomedical research scientist at Mount Sinai School of Medicine of New York University and Children's Hospital Los Angeles. He was Assistant Professor and Principal Investigator of Stem Cell & Regenerative Medicine at Keck School of Medicine and Ostrow School of Dentistry of The University of Southern California, USA. In 2016, Prof. Hashash has joined The University of Edinburgh, Edinburgh Medical School-Zhejiang International Campus, (ZJU) as Tenure-Track Associate Professor and Senior Principal Investigator of Biomedicine, Stem Cell & Regenerative Medicine. He is also adjunct Professor at the School of Basic Medical Science and School of Medicine, Zhejiang University. Prof. Hashash has several breakthrough discoveries in genes/enzymes that control stem cell behavior and regenerative medicine. He has published more than 25 papers in reputed international journals and serving as an editorial board member of repute. Prof. El-Hashash acts as a discussion leader at the prestigious Gordon Research Seminar/Conference in USA, and a Peer Reviewer/ International Extramural Review for The Medical Research Council (MRC) grant applications, London, UK. He is invited to speak at several international conferences in USA, Spain, Greece, Egypt and China. He is the editor or author of several books on stem cell and regenerative medicine.