

Sugar-powered enzymatic biofuel cells for bioelectricity generation

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Abstract

Enzymatic biofuel cells (EBFCs) are a kind of fuel cells that convert chemical energy in fuels such as sugars into electric energy via enzyme biocatalysts. They have been considered as a green and safe bioelectricity generation technology that holds the promise to power numerous portable, wearable or implantable electronic devices in the future. Over the last decade, we have focused on solving their challenges including incomplete oxidation of the fuel, limited power output, and poor lifetime, through multiple aspects such as constructing enzymatic pathways, engineering enzymes, optimizing electron transfer paths, and fabricating novel electrode materials. Further efforts will be made towards the in-depth understanding the electron transfer process at the interface of enzyme-electrode as well as the demonstration of more applications in the field of bioelectronics and biosensing.

Brief Biography

Zhiguang Zhu has been served as the Professor at Tianjin Institute of Industrial Biotechnology, Chinese Academy of Sciences, since 2016. He received his Ph.D. in Biological Systems Engineering at Virginia Tech in 2013 and a B.S. in Biotechnology at Huazhong University of Science & Technology in 2007. His research is focusing on the field of biochemical engineering, biocatalysis, biofuel cells and bioelectrochemical synthesis. He uses the tools and principles of synthetic biology, bioelectrochemistry, and bionanotechnology to investigate fundamental sciences behind biocatalysis and electron transfer, and construct bioelectrocatalytic systems for real applications. He has published nearly 40 papers on the journals such as Chemical Reviews, Nature Communications, Metabolic Engineering, and Biosensors and Bioelectronics, and authored 4 book chapters. He is also holding 5 patents in the area of enzymatic biofuel cells.

Brief CV

Zhiguang Zhu, Ph.D.

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Education:

B.S. Biotechnology, Huazhong University of Science and Technology, China, 2007

Ph.D. Biological Systems Engineering, Virginia Tech, US, 2013

Professional Career:

2013-2016: Cell-Free Bioinnovations Inc., US, CTO.

2016-Present: Tianjin Institute of Industrial Biotechnology, Chinese Academy of Sciences, China, Professor.

Research Interests:

1. Biocatalysis and biochemical engineering
2. Biofuel cells and bioelectrocatalytic systems

Selected publications

1. Wu, R. et al. *Curr. Opin. Electrochem.*, 2019, in press.
2. Xiao, X. et al. *Chem. Rev.*, 2019, doi/10.1021/acs.chemrev.9b00115
3. Kang, Z. et al. *Biosens. Bioelec.*, 2019, 132:76-83.
4. Wu, R. and Zhu, Z. *ACS Sustain. Chem. Engin.*, 2018, 6:12593-12597.
5. Wu, R. et al. *ChemCatChem*, 2018, 10:2030-2035.
6. Zhu, Z. et al. *Metab. Engin.*, 2017, 39:110-116.
7. Zhu, Z. et al. *Nat. Commun.*, 2014, 5:3026.