

Sustainable Materials and Technology

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Microbial Fuel Cells for Environmental Remediation


 Springer

Editors:

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-

- Reviews the key topics in microbial fuel cells (MFC) and its applications
 - Demonstrates the simultaneous use a microbial fuel cell, as an energy source, bioremediation, and biosensor device
 - Covers the synthesis and characterization of advanced polymer-based electrodes
- Part of the book series:** [Sustainable Materials and Technology](#) (SMT)
- **1455** Accesses
 - **1** [Altmetric](#)

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About this book

This book comprehensively reviews the key topics in microbial fuel cells (MFC) and its applications in areas related to energy and environmental mitigation. It covers the microbial electrochemistry and the generation of electricity from waste, various synthesis and characterization approaches of polymer-based MFC electrodes, the multifunctional properties of a MFC which allows its simultaneous use as a fuel cell, bioremediation and biosensor device. It provides new direction to the readers to better understand the chemistry in MFC and methods to improve their desired properties. This book is a very valuable reference source for graduates and postgraduates, engineers and research scholars in the areas related to fuel cells electrochemistry and pollution mitigation.

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Dr. Akil Ahmad currently working at Prince Sattam bin Abdulaziz University, Saudi Arabia as Assistant Professor in Chemistry and having the experience of seven years as Research Fellow, Teaching Fellow, Postdoc and Visiting Researcher from Universiti Teknologi Malaysia, Universiti Sains Malaysia, University of KwaZulu-Natal, South Africa and Universiti Kebangsaan Malaysia, Malaysia. He has completed Ph.D. in Analytical Chemistry (2011) with the topic "Modification of resin for their use in the separation, preconcentration and determination of metal ions" from Aligarh Muslim University (AMU), India. His research interest in the areas of environmental pollutants and their safe removal, synthesis of nanoparticles and Nano-sorbents (GO, CNT), photo-degradation and antimicrobial effects, water and wastewater treatment and adsorption and ion-exchange. He has published more than 100 research articles and chapters in the journals and publishers of international repute such as Scientific reports, Talanta, Chemical Engineering Journal, Journal of Industrial and Engineering Chemistry, Journal of Molecular Liquids etc. He has also edited five books of Springer and Elsevier. H-index and citation in Scopus are 23 and 1942 and in Google scholar, H-index and citation are 26 and 2546. He is guest editor of many reputed journal namely *Adsorption Science and Technology*-Hindawi, *Polymers* MDPI, *Frontiers in Environmental Chemistry* and *Journal of Chemistry*, Hindawi.

Dr. Mohamad Nasir Mohamad Ibrahim obtained his B.Sc. (1994), M.Sc. (1997) and PhD (1999) from Missouri S&T (formerly known as University of Missouri-Rolla, USA). He is currently served as Associate Professor in the School of Chemical Sciences, Universiti Sains Malaysia (USM). He had published more than 120 journal articles, 17 book chapters and 5 academic books throughout his twenty-year career in USM including

"Graphene: A Versatile Advanced Material." Currently, his Scopus h-index is 27 with 2716 citations and he had been granted with ten patents for his R&D products/processes where five of them are at an international level. More than thirty research grants (one international grant and five industry grants) were secured and utilized to support his team's research activities. He had received fourteen international awards for his research outputs and currently serve as Guest Editor for Frontiers in Chemistry. He had supervised more than 20 graduate students. His main research areas are lignin and lignocellulosic materials, nanoparticles, graphene and biomaterials and petroleum engineering. Recently, he is busy working in the microbial fuel cells topic especially in developing a novel electrode and had published 4 Q2 and 1 Q1 papers in well-reputed journals such as Chemical Engineering Journal, etc. At the moment, he is the pioneer on MFCs research topic in the School of Chemical Sciences, USM. He enjoys sharing his industrial experience, where he spent two and half years worked as a R&D Manager at NSE Resources Corporation Sdn Bhd., in his classes.

Asim Ali Yaqoob is currently working as PhD scholar at School of Chemical Sciences, Universiti Sains Malaysia (USM) under the supervision of Dr. Mohamad Nasir Mohamad Ibrahim. His area of interest is wastewater treatment and currently his project is on microbial fuel cells. He has published 10 articles in high reputed journals and several book chapters. He also a co-author for an academic book (Graphene: A Versatile Advanced Material) published by USM Press, Malaysia. He has completed M.Phil in Material Chemistry (2018) with the topic of "Designing and characterizing of Ag@Polycarbazole nanocables" from Mirpur University of Science and Technology (MUST), AJK Pakistan. His Google scholar H-index and citation are 06 and 103, respectively, and has filed one patent for an industrial process. He has reviewed several manuscripts for various journals such as Journal of Energy, Environmental and Chemical Engineering (JEECE) (ISSN Online: 2637-434X) and RSC Medicinal Chemistry (ISSN 2632-8682). He enjoys sharing his industrial experience, where he spent one years worked as a research assistant at Ekahala Resources Sdn Bhd, Malaysia.

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commercialization grants. She has been coached by Barbara Diehl (Innovation Academy, Dublin), BioEconomy Corporation, CEO of Al-Ikhsan Sports and Kosmetik Alwan, Platcom Ventures, Cradle, TERAJU, and Micheal Herrera (Branding Consultant). She obtained many supports from various agencies, and with that, she is now focusing on realizing her dream to provide high-quality-affordable products for her society that is based from her expertise in micellar nanotechnology, wastewater treatment.

Bibliographic Information

- **Book Title** Microbial Fuel Cells for Environmental Remediation
- **Editors** Akil Ahmad, Mohamad Nasir Mohamad Ibrahim, Asim Ali Yaqoob, Siti Hamidah Mohd Setapar
- **Series Title** [Sustainable Materials and Technology](#)
- **DOI** <https://doi.org/10.1007/978-981-19-2681-5>
- **Publisher** Springer Singapore
- **eBook Packages** [Chemistry and Materials Science](#), [Chemistry and Material Science \(R0\)](#)
- **Copyright Information** The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2022
- **Hardcover ISBN** 978-981-19-2680-8
- **Softcover ISBN** 978-981-19-2683-9
- **eBook ISBN** 978-981-19-2681-5
- **Series ISSN** 2731-0426
- **Series E-ISSN** 2731-0434
- **Edition Number** 1
- **Number of Pages** XIV, 446
- **Number of Illustrations** 12 b/w illustrations, 68 illustrations in colour
- **Topics** [Fuel Cells](#), [Environmental Chemistry](#), [Pollution](#)

Conventional Electrode Materials for Microbial Fuel Cells

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- [Khalid Umar](#),
- [Akil Ahmad](#),
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- Chapter
- [First Online: 06 October 2022](#)

- **76** Accesses

Part of the [Sustainable Materials and Technology](#) book series (SMT)

Abstract

The use of microbial fuel cells (MFCs) has gained a lot of attention as a means to combat both energy shortages and water pollution. Despite their best efforts, MFCs are unable to produce substantial amounts of energy or effectively remove pollutants due to a number of difficulties, one of which being the electrode. One of the most significant components of an MFC is the electrode. Different types of electrode materials have recently been developed to boost pollutant removal rates and energy production efficiency. Carbon-based materials have been used as the most often used electrode material in MFCs. A wide range of potentials is now accessible for use in the manufacturing of electrode materials, which can significantly reduce current issues such as the demand for high-quality materials and their cost. In the present chapter, the conventional electrode material is briefly discussed with their influence and role in MFC operation and performance. A brief discussion of the current issues and future views of electrode materials is also included.

Keywords

- **Microbial fuel cells**
- **Electrode material**
- **Biomass**
- **Energy generation**

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Acknowledgments

The authors would like to express their appreciation to the School of Chemical Sciences, USM.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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About this chapter

Cite this chapter

Hussain, R.T., Umar, K., Ahmad, A., Bhawani, S.A., Alshammari, M.B. (2022). Conventional Electrode Materials for Microbial Fuel Cells. In: Ahmad, A., Mohamad Ibrahim, M.N., Yaqoob, A.A., Mohd Setapar, S.H. (eds) Microbial Fuel Cells for Environmental Remediation. Sustainable Materials and Technology. Springer, Singapore.
https://doi.org/10.1007/978-981-19-2681-5_6

Download citation

- [.RIS](#)
- [.ENW](#)
- [.BIB](#)
- DOI https://doi.org/10.1007/978-981-19-2681-5_6
- Published 06 October 2022
- Publisher Name Springer, Singapore
- Print ISBN 978-981-19-2680-8
- Online ISBN 978-981-19-2681-5
- eBook Packages [Chemistry and Materials Science](#) [Chemistry and Material Science \(R0\)](#)

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