

BOOK REVIEW

Can Biofuels Alleviate the Energy and Environmental Crisis?

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Amongst 7 chapters of the book, Chapter 1 summarizes the role of *Biomass as a Sustainable Feedstock for Biorefinery*. This chapter provides some fundamental information of cellulose, hemicellulose, and lignin. Albeit the contents of this chapter have been described extensively in the literature, this book is useful for beginners who are not very familiar with the subject. Chapter 2 unravels the use of microwave irradiation for biodiesel production "Continuous Flow Microwave Irradiation of Biomass for Large Scale Biodiesel Production." The conversion time is a matter of seconds but one might question that the production of biodiesel using microwave is really qualified for the "large-scale" production of biodiesel. Chapter 3 involves the production of bioethanol, the first part is the conversion of cellulose to ethanol whereas the second part describes the production of bioethanol by microalgae, notably the use of solar energy. However, this chapter will be appealing if some economic aspects of such production processes can be included to highlight some advantages and disadvantages of each production process. Surprisingly, Chapter 4 describes the production of glucose from starch and glycogen. Perhaps, this chapter should follow Chapter 1 to provide the reader some novel procedures for the production of glucose from food wastes. Chapter 5 focuses on the production of levulinic acid using microwave irradiation or hydrothermal reaction and solid catalysts.

Chapter 6 advocates the use of NaBH_4 in protic and aprotic solvents as an effective reducing agent for the conversion of carbon dioxide to formic acid. The issue of CO_2 and "climate change" has become a serious subject and the reader might find some interesting information related to the conversion of CO_2 to methane and formic acid. The last chapter (Chapter 7), poses an important question: "CAN BIOFUELS LIGHT OUR LAMPS?". The authors describe the potential of bioethanol as a feasible fuel for the operation of direct ethanol fuel cells, i.e., the transformation of chemical energy from ethanol to electrical energy. Biomass forms the single largest carbon source on earth's surface that could be converted to almost all the fuels, chemicals and materials that are so far derived from fossil resources. This book provides the know-how and serves as a guide for a smooth transition from fossil-based to a bio-based economy. The style adopted by the authors is coherent throughout and it has been a pleasant experience glancing through the well-written, ~ 200 pages of the book. The book is rich in innovation, diversity (bioresources and pathways of biomass conversion), and scientific approach to solving the problems of scarcity of energy sources and environmental pollution.

Apart from discussing the unconventional methods of activation (sono-chemical, microwave and solar irradiation) for the production of major biofuels, like biodiesel and bioethanol, the authors have been visionary in providing strategies for the exploitation of CO_2 as an ideal C_1 bio-based feedstock for the biorefinery operations for producing fuels as diverse as synthesis gas, methane, ethylene and formic acid via catalytic and non-catalytic modes of activation. NaBH_4 , a versatile reducing agent, is proposed as an ideal reductant for the selective conversion of CO_2 formic acid, a reservoir of H_2 . The demonstration of

bioethanol driven fuel cells has been one of the frontiers in the research on renewable (electrochemical) energy sources.

This book will be an asset to any of the libraries holding the same in their catalogs and book-shelves. This book serves as an excellent resource material to academicians offering semester course on "Alternate energy sources" in the subject areas of Chemistry, Chemical Engineering and Materials Science for the students pursuing post-graduate studies and forms a reliable reference book for scientists and young research scholars carrying out research in the field of "Biomass conversion". The book will be valuable for the beginners in the field to familiarize themselves with hydrothermal conversion, microwave irradiation, and solid catalysts. Characterization of products by NMR is frequently encountered in several chapters. Owing to the originality of the research findings, mainly from the labs of the authors, as well as the coherent style of presentation in the 7 chapters forming the masterpiece – "Can biomass alleviate energy and environmental crisis?", I have no hesitation in endorsing the publication of the book by Nova Science Publishers, Inc., I strongly encourage and recommend the students, academicians, scientists, regulatory, and policymakers to glean through the adaptable solutions the authors have provided for the major problems (climate change and energy crisis) the world is facing currently.

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