Book review

Biomass as a sustainable energy source for the future: fundamentals of conversion processes

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Wiebren de Jong and J. Ruud van Ommen (Eds.)
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Biomass as a sustainable energy source for the future: fundamentals of conversion processes, edited by Wiebren de Jong and J. Ruud van Ommen, is a captivating book in which the authors provide a comprehensive discussion on conversion of biomass into different energy forms.

The book is well structured. It is arranged in 18 chapters divided in four main sections. Although the topics are diverse, they are well interconnected, which makes the reading easy and pleasant.

In Part I (Chapters 1 and 2), the authors focus on a description of the social context of biomass use as an energy source (Chapter 1). They explain that there are three approaches to sustainable energy supply: (i) efficiency and savings, (ii) clean fossil fuels and nuclear energy with carbon capture and storage, and (iii) renewable energy sources. For the preparation of this book, the authors focused their attention on the latter approach. Then, in the second chapter, they introduce the main physicochemical characteristics of biomass and briefly discuss some characterization techniques.

In Part II (Chapters 3–7), the authors introduce chemical engineering principles in relation to biomass processing (Chapters 3–6). They concentrate on topics such as material and energy balance, heat and mass transfer, thermodynamics, kinetics, and reactor design. The authors succeed in explaining the connection between chemical engineering principles and biomass processing. They achieve it by combining general chemical engineering knowledge with examples oriented to biomass processing. Then, in Chapter 7, the authors introduce a hierarchical approach to decision making in conceptual process design (CPD). This topic is presented in a general form; thus, it can be used as a general guide for CPD.

In Part III (Chapters 8–15), the authors discuss technologies for biomass conversion, from physical pretreatment of raw biomass material to thermochemical conversion, biochemical conversion, and biorefinery integration. They also provide a framework to carry out economic evaluations of bio-based processes, and they show examples that clearly illustrate how to perform them.

In Part IV (Chapters 16–18), the authors draw attention to end uses of biomass and economic analysis. The authors reflect on the use of solid oxide fuel cells as an option for decentralized power generation. Then, they analyze and compare the transformation of biomass into transportation fuels, such as synthetic natural gas, hydrocarbons (Fischer-Tropsch, FT), methanol, and dimethyl ether. They conclude that there is no clear agreement about the most valuable route. Surprisingly, a clear comparison between FT and methanol-to-gasoline synthesis for the production of liquid fuels is not included.

In conclusion, this book is very rich in technical content, both theoretical and practical. The authors present a great variety of examples and figures, with clear and detailed descriptions, which contributes to an easy understanding of the content. Also, each chapter includes a list of acronyms and symbols used, which provides the reader a simple tool to rapidly understand all the symbology shown. Additionally, this book has a great amount of references that allow the reader to dig further in any specific topic. The language used is clear, and the material is enjoyable and easy to read. In my opinion, this book is valuable for undergraduates, postgraduates, and professionals with interest in the use of biomass as an energy source. The inclusion of chemical engineering principles and their connection to biomass processing and use (Part III) represent an important contribution of this book to current literature, a link that is sometimes forgotten.

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