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Review of 'Solid Biofuels for Energy–A Lower Greenhouse Gas Alternative' by Panagiotis Grammelis

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Book details

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Fossil fuels, widely used for electricity generation and heating, emit greenhouse gases which should be minimized according to the most recent environmental legislation. The utilization of solid fuels of biogenic origin could contribute, to some extent, towards the aim of reducing greenhouse gas emissions. Within this book, special attention has been given to biomass co-firing with coal as it has the highest potential for commercial application in large-scale units, whereas according to the author's interpretation, combustion and gasification are more promising for units of small to medium scale. In chapter 1, key questions arising from biomass availability and supply are discussed. A detailed analysis of solid agricultural biomass feedstock in EU27 summarizes the relevant data, which influence the availability and future supply of this feedstock for energy and fuel production. The European Standards for the specifications of solid biofuels are presented in chapter 2. Chapter 3 provides an overview of all technical issues for biomass-coal co-firing in boilers designed exclusively for coal (mainly pulverized coal) combustion. Biomass-coal co-combustion represents a low-risk, low-cost, sustainable, renewable energy option that promises an effective near-term reduction in CO_2, SO_X, and often NO_X emissions, as well as several societal benefits. A step ahead on co-firing development is covered in chapter 4 in which the co-utilization of solid recovered fuels (SRF) with coal is extensively reviewed. SRF are solid fuels prepared from high-calorific fractions of non-hazardous waste materials intended to be fired in existing coal power plants and industrial furnaces. The subject of chapter 5 deals with the biomass combustion characteristics. Unlike pulverized coal, biomass particles are neither small enough to neglect internal temperature gradients nor equate enough to model them as spheres. Experimental and theoretical investigations indicate particle shape and size influence on the biomass particle dynamics, including essentially all aspects of combustion such as drying, heating, and reaction. This chapter theoretically and experimentally illustrates how these effects impact particle conversion. Fluidized bed combustion (FBC) technology developed in the 1970s has recently expanded to the usage of biomass and other low-grade fuels as presented in chapter 6. The benefit of the FBC is the large amount of bed material compared to the mass of the fuel and, thus, the large heat capacity of the bed material that stabilizes the energy output caused by variations in fuel properties. Another thermochemical conversion technology for biomass is gasification which is examined in chapter 7. Gasification is a mature technology for energy production that permits an easier separation of CO_2 for its storage. This chapter concentrates on syngas end uses, focusing on newly developed ones, such as gas turbines or engines in IGCC, synthesis of methanol, ethanol, and dimethyl ether, Fischer-Tropsch synthesis, and hydrogen production. Integrated schemes of micro-CHP and biofuels are very promising for decentralized applications. Renewable micro-CHP systems are a combination of micro-CHP technology and renewable energy technology, such as biomass gasification systems or solar concentrators. Chapter 8 discusses the state of the art of technological options in the field of renewable micro-CHP with biofuels with regard to technology, cost, and environmental impacts. It also presents a market survey concerning the possibility of future penetration of the technology in Europe. Chapter 9 provides an overview of the main ash formation and deposition

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mechanisms for various relevant biomass fuels, including blends with selected coals, in pulverized-fuel boilers. The book ends with an overview of the different forms of ash usage that exist or are being developed for biomass ashes, as presented in chapter 10.

Key aspects for the energy exploitation of solid biofuels are considered in this book, providing valuable information for the reader who is familiar with the biomass sector. Even for an amateur, basic knowledge is provided since all potential methods for solid biomass exploitation are described. This book presents the current status of the engineering disciplines in this specific area, providing an extensive overview of the energy exploitation options of solid biomass. In this sense, all thematic priorities related to the solid bioenergy potential and standardization, the energy technologies (commercialized and emerging technologies), and the quality of solid residues are presented. Consequently, the book is addressed to all those who want to get an overview of new approaches in solid biomass usage for heat, power, and fuel production. The book *Solid Biofuel for Energy–A Lower Greenhouse Gas Alternative* is dedicated to advanced students, researchers, and experts from industrial and governmental organizations who are interested in solid biomass usage for energy supply as an alternative to fossil fuels. The book provides a good overview to readers interested in this subject matter.

Competing interests
The author declares that they have no competing interests.

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