BOOK REVIEW: "*MATERIALS, CHEMICALS & ENERGY FROM FOREST BIOMASS*"

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Recently an excellent book on lignocellulosic-based biomass has been published. The book can be expected to profoundly impact research and development for sustainable science and engineering. For this reason we have decided to provide our readers with a review of this new ACS Press book entitled "*Materials, Chemicals & Energy from Forest Biomass*" edited by Dimitris S. Argyropoulos from NC State University. The book features unique, peer-reviewed chapters that were submitted to the American Chemical Society's Pacifi-Chem 2005 Meeting in Honolulu, Hawaii. It presents a timely and focused review of research efforts encompassing work from the most pertinent derivatives of wood and related resources that include new polymers, composites, niche chemicals, and biofuels. This book will ultimately serve a number of disciplines and promises to focus the discussion of biomass for new avenues of chemicals, fuels, and materials.

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OUR TAKE ON THE BOOK

Consumers have become increasingly concerned over the prospect of current and continuing increases in fuel costs, environmental emissions, global warming, and non-biodegradable landfills. Although these issues are not entirely new, they have achieved heightened public awareness by the recent dramatic spike in the price of a barrel of oil (well over $100 US) and the concomitant industrial development of foreign economies, particularly that of the Chinese. As Argyropoulos alludes, it is now incumbent upon us as a society to explore alternative means to achieve independence from petroleum. His contention, which nucleated the symposium and the offspring book, is that ligno-cellulosics are readily able to achieve that independence. How is that possible? Quite simply, because lignin and carbohydrates are the most available renewable resources on the planet and lend themselves to simple and elegant chemical transformations that culminate in petroleum substitutes.

However, the editor relates quite starkly that only a paltry 3% of the earth's vast lignocellulosic bioresource is used by humans for energy, chemicals, and/or materials. The major challenge at hand to achieving a long term solution to supplant petroleum is to find the logical chemical, biological, and engineering pathways to ensure efficiency and economy of scale for the transformations. Indeed, it is explicitly stated that the fundamentally different chemistries of hydrocarbons versus lignin and carbohydrates may introduce serious obstacles to the facility of the transformations. Therefore, it has been

long recognized that an efficient and economic transition to a bio-based economy has been hampered because of the inexpensive petroleum-based economy. Yet, we now appreciate that petroleum is no longer as abundant and hence as cheap as it once was and that any benefits we enjoyed will likely, in the words of the editor, "fade away within the next 50 years."

This book is one among several seminal attempts to focus our attention on nurturing the chemical and engineering developments necessary to expedite the bio-based economy. The review and primary literature is ripe with current work in this area, but the book provides one of the first efforts to connect them in a very logical and organized way and thus provide the reader with a holistic understanding of this rich area. In fact, the book offers a collection of authoritative reviews at the onset that help the reader coalesce the challenges and potential of the newly developing discipline. The book is divided into five sections: critical reviews, materials from forest biomass, chemicals from forest biomass, energy from forest biomass, and novel analytical methods for the structural elucidation of forest biomass. Each of these sections provides an altogether up-to-date accounting of not only the research progress in these areas, but what is in store for the future, especially the reviews.

For example, the first contribution by Lucia et al. ("Chemicals, Materials, and Energy from Biomass: A Review") examines the overall state of energy and chemical conversions in current research efforts and what is possible for the future. Likewise, but in the analogous academic perspective, Ramaswamy et al. in "Transforming Academic Curricula: From Pulp and Paper to Biobased Products" describes ongoing efforts at the University of Minnesota to transform the academic curricula to meet the anticipated changes in the forest and allied industries.

Overall, this ACS volume is an excellent compendium of the current state of research in the burgeoning area of renewable materials. Each contribution in the book is well conceived, organized, and will serve not only the technically savvy, but also the casual reader interested in learning more about the arena of bio-based products and energy. For example, the first contribution in the section on energy by Kenealy et al. ("Pretreatments for Converting Wood into Paper and Chemicals") is a very easy-to-read review of methods to obtain sugars from wood and the ensuing use of these sugars and the wood by-product. It is a very good introduction into the value of biomass as a commodity for energy transformations. We heartily recommend this book to all readers who wish to gain a better understanding of how biomass from the forest can be used to not only supplement the current petroleum-based economy, but potentially to replace it.

WEB LINKS

http://www.oup.com/us/catalog/general/subject/Chemistry/MaterialsChemistry/?view=usa&ci=9780841239814 (Oxford University Press)

http://www4.ncsu.edu/~dsargyro/MATERIALS_CHEMICALS_AND_ENERGY.pdf (*Current Engineering Practice* 480506 / S11A)