This book is excellent. It treats an extremely important topic in great detail with an impressive list of contributions from all over the world (46 contributors from 18 countries). It is a tremendous compilation of the state-of-the-art of pyrolysis of waste plastics. Anyone interested in the field must consult this text.

Gary F. Bennett *
The University of Toledo, Department of Chemical and Environmental Engineering, Mail Stop 305, Toledo, OH 43606-3390, United States

* Tel.: +1 419 531 1322; fax: +1 419 530 8086.
E-mail address: gbennett@eng.utoledo.edu

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Fundamentals of Environmental Sampling and Analysis, C. Zhang. John Wiley & Sons, Inc., Hoboken, NJ (2007). 456 pp., Price: US$ 99.95, ISBN: 978-0-471-71097-4

In the preface, Zhang clearly articulates the need for information in this book by stating:

> "The acquisition of reliable and defensible data through proper sampling and analytical techniques is often an essential part of the careers for many environmental professionals."

And to satisfy this need, Zhang has authored this book whose

> "...overall objective...is to introduce a comprehensive overview on the fundamentals of environmental sampling and analysis for students in environmental science and engineering as well as environmental professionals who are involved in various stages of sampling and analytical work."

The author notes that his goal was to produce a book focusing on "why" rather than "how." In my opinion, he has done this well. However, those looking for description of "how to" techniques will not be disappointed as there is much information in the book.

Zhang describes the content of the book as follows:

> "Chapter 1 starts with an overview on the framework of environmental sampling and analysis and the importance for the acquisition of scientifically reliable and legally defensible data. Chapter 2 provides some background information necessary for the readers to better understand the subsequent chapters, such as review on analytical and organic chemistry, statistics for data analysis, hydrogeology, and environmental regulations relevant to sampling and analysis. The following two chapters introduce the fundamentals of environmental sampling - where and when to take samples, how many, how much, and hot to take samples from air, liquid, and solid media.
>
> Chapter 5 introduces the standard methodologies by the US EPA and other agencies. Their structures, method classifications, and cross references among various standards are presented to aid readers in selecting the proper methods. Quality assurance and quality control (QA/QC) for both sampling and analysis are also included in this chapter as a part of the standard methodology. Chapter 6 provides some typical operations in environmental laboratories and details the chemical principles of wet chemical methods most commonly used in environmental analysis. Prior to the introduction to instrumental analysis and applications in environmental analysis in Chapters 8–12, various sample preparation methods are discussed and compared in Chapter 7.
>
> In Chapter 8, the theories of absorption spectroscopy for qualitative and quantitative analysis are presented. UV-visible spectroscopy is the main focus of this chapter because nowadays it is still the workhorse in many of the environmental laboratories. Chapter 9 is devoted to metal analysis using various atomic absorption and emission spectrometric methods. Chapter 10 focuses on the instrumental principles of the three most important chromatographic methods in environmental analysis, i.e., gas chromatography (GC), high performance liquid chromatography (HPLC), and ion chromatography (IC). Chapter 11 introduces the electrochemical principles and instrumentations for some common environmental analysis, such as pH, potential titrations, dissolved oxygen, ion selective electrodes, conductivity, and metal analysis using anodic stripping voltammetry. Chapter 12 introduces several analytical techniques that are becoming increasingly important to meet today's challenge in environmental analysis, such as various hyphenated mass spectrometries using ICP/MS, GS/MS and LC/MS. This last chapter concludes with a brief introduction nuclear magnetic resonance spectroscopy (less commonly used in quantitative analysis but important to structural identifications in environmental research) and specific instrumentations including radiochemical analysis, electron scanning microscopes, and immunoassays."

The reader of this review will, I am sure, agree with me that all aspects of environmental sampling are well covered. I was particularly interested (from my personal perspective) in a discussion of the dissolved oxygen electrode which I utilized in my own research more than 50 years ago. I was surprised by a discussion of air sampling equipment and sampling techniques in a book that deals mainly with water. The discussion of air sampling was not extensive, but it was useful. Another useful inclusion was a succinct summary of US environmental laws.

Other very beneficial aspects of the book include:

- copious, excellent equipment diagrams;
- QA/QC discussion;
- introduction of advanced analytical techniques such as various hyphenated mass spectrometries and nuclear magnetic resonance spectroscopy;
- approximately 25 questions and problems for student assignment in each chapter;

- appendix with 15 student experiments covering various sampling and analytical techniques such as computer-based data analysis, field sampling, laboratory wet chemical techniques, and instrumental analysis.

There is nothing I can add further other than to say that this is an excellent book that I am sure will be adopted by many faculty members.

Gary F. Bennett*
The University of Toledo, Department of Chemical and Environmental Engineering, Mail Stop 305, Toledo, OH 43606-3390, United States

* Tel.: +1 419 531 1322; fax: +1 419 530 8086.
E-mail address: gbennett@eng.utoledo.edu

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Alcoholic Fuels, S. Minteer (Ed.). CRC Press, Taylor & Francis Group, Boca Raton, FL (2006). 295 pp., Price: US$ 99.95, ISBN: 0-8493-3944-8

This book is the second that I have received this week on a very current environmental topic. The first book involved the disposal of waste materials; this book addresses the production of alcoholic fuels from renewable resources. It is certainly timely as my review was written shortly after U.S. President Bush visited Brazil and discussed ethanol production with the president of that country.

This book, however, covers a broader range of fuels than simply ethanol. Other potential alcohol fuels such as methanol, propanol, and butanol also are discussed. Of these fuels, ethanol is the most discussed as "the potential fuel of the future," but that remains to be seen.

In the first chapter, Minteer provides an overview of the material in the book. She writes:

> "Alcohol-based fuels have been important energy sources since the 1800s. As early as 1894, France and Germany were using ethanol in internal combustion engines. Henry Ford was quoted in 1925 as saying that ethanol was the fuel of the future. He was not the only supporter of ethanol in the early 20th Century. Alexander Graham Bell was a promoter of ethanol, because [of] the decreased emission to burning ethanol."

Of the four alcohols noted above, methanol and ethanol are the most commercially viable. Both of these alcohols have been blended with gasoline, but as an additive, ethanol is preferred. However, "methanol has found its place in the market as an additive for biodiesel and as a fuel for direct methanol fuel cells which are being studied as an alternative for rechargeable batteries in small electronic devices."

The book has 15 chapters divided into three main sections as shown below.

Overview

Section I: Production of alcohol fuels
- Production of methanol from biomass.
- Landfill gas to methanol.
- The corn ethanol industry.
- Development of alfalfa (*Medicago sativa* L.) As a feedstock for production of ethanol and other bioproducts.
- Production of butanol from corn.

Section II: Blended fuels
- Ethanol blends: E10 and E-Diesel.
- Using E85 in vehicles.

Section III: Applications of alcoholic fuels
- Current status of direct methanol fuel-cell technology.
- Direct ethanol fuel cells.
- Solid-oxide fuel cells operating with direct-alcohol and hydrocarbon fuels.
- Alcohol-based biofuel cells.
- Ethanol reformation to hydrogen.
- Ethanol from bakery waste: the great provided for aquaponics?
- Conclusion.

I was employed as a summer student by Hiram Walker Distillery in Canada. Subsequent to that, I wrote a doctoral thesis in the biochemical engineering area, after which I accepted a teaching position. One of the courses I taught routinely was biochemical engineering in which the first set of lectures discussed ethanol fermentation. I ended that discussion with an examination of the energy balance. Of note, at that time, the balance was negative based solely on the fermentation and distillation processes. Today, however, the literature indicates that there may be a different story. I am not yet convinced, if the energy to produce the corn and its transport is considered, that the energy balance will be on the plus side. However, other renewable biomass materials may well be more profitable from an energy balance standpoint.

Energy recovery aside, ethanol in gasoline reduces emissions. Indeed, the authors of Chapter 4, Nichols et al. note that ethanol production is a growing industry in the United States wherein in 2004, 1.26 billion bushels of corn equal to 11% of the total U.S. corn crop were processed to ethanol. This topic is discussed in a much too short (20-page) chapter. Given my background bias, I think this topic demanded more attention.

Butanol also can be produced by carbohydrate fermentation. It is noted that process dates back to Louis Pasteur in 1861. Later, Chaim Weizmann isolated a microorganism, *Clostridium acetobutylicum*, that could ferment starch to acetone, butanol, and ethanol.

The second major section of this book, as the five major chapter headings note, discusses the blending of alcohol in low concentrations with gasoline to improve emissions. The second