- 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.

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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 chapter in this section discusses E85 use for vehicles. This compound is a blend of 85% ethanol and 15% gasoline. Its use has been encouraged because it dramatically reduces exhaust and greenhouse gas emissions.

In the third section, several chapters are devoted to alcohol fuel cells—methanol and ethanol. The chapter titles listed above are an indication of their use.

To complete the review, I return to an earlier chapter which reviews the production of methanol from landfill gas. Landfills are a major source of methane which is produced by anaerobic decomposition of organics. Methane and carbon dioxide are produced in almost equal amounts. The former is a major contributor to global warming so its control (and even better its beneficial use) is of much interest. The methane could be flared and is in many instances, but its recovery for use as a fuel is beneficial. This chapter goes one step further, discussing the conversion of landfill gas to methanol.

This is a very long review for a relatively short book, but the importance of the topic demands it.

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Analytical Techniques for Atmospheric Measurement, D.E. Heard (Ed.). Blackwell Publishing Ltd., Oxford, UK (2006). 528 pp., Price: € 99.50, ISBN: 978-1-4051-2357-0

The atmosphere is under intense scrutiny worldwide, especially with respect to the affect of its changing composition on global warming. The impact of changes in the concentration of atmospheric contaminants is significant – but to develop theories that predict their changes, scientists must be able to measure the atmospheric concentration of contaminants – which are numerous and most often in very low concentrations.

The book has been "... written as an authoritative guide to the techniques of instrumental measurement ...." It focuses on the instruments used to make real time measurements of atmospheric gas and aerosol composition.

The editor states that: "The major aim of this book is to take the focus away from the results and the advances resulting from field measurements (very important as they are), and to place the emphasis on the instruments themselves: how they work, their strengths and weaknesses for a particular task, the platforms on which they have been deployed, how they are calibrated, etc." The fundamental principles upon which the instrumental techniques are based are also reviewed.

> "The book is designed to appeal to two major types of audience. One class of readers are those who wish to gain a general understanding of instrumentation for measurement of atmospheric composition, the fundamental principles upon which the techniques depend, their major capabilities together with highlights of the important results and the advances and understanding that have resulted—but without wanting a detailed discussion of the underlying atmospheric chemistry or physics." "The other class of readers are field scientists or instrument developers who are more experienced, and who will be interested in the finer detail of specific instruments, and latest developments, and perhaps wish to discover if a particular technique were suitable for a new measurement."

In the opening chapter, Heard notes:

> "Field measurements are necessary over a wide range of temporal and spatial scales in order to record any long-term trends, and also to test how well models can predict the composition of the current atmosphere. Although a complete understanding of the complex process within out atmosphere requires an integration of field measurements, computer modelling and laboratory studies, almost all of the major breakthroughs have been initiated by field observations. Without the development of a suite of sensitive and accurate field instrumentation we would not be aware of the links between greenhouse gases/aerosols and global warming, the formation of ozone holes in the stratosphere, the deterioration in air quality on our cities, the changes in the oxidising capacity of the atmosphere, or other threats to our well-being."

Heard cites examples of the results of the above techniques. These results include the discovery of the ozone hole and the invention of the electron capture detector.

Heard further describes (in the first chapter) the scope of the book:

> "This book will primarily address instruments used to make quantitative measurements of the chemical composition of the atmosphere. Instruments to measure the structure of the atmosphere – for example, micro-meteorological determinations of the instantaneous three-dimensional wind velocity ... or the measurement of deposition velocities of the earth's surface – are not covered. However as the majority of atmospheric processes in the atmosphere are initiated by the absorption of sunlight, at a rate dependent upon the rate of photolysis of certain trace gases, the book includes a chapter on techniques to measure photolysis frequencies directly or to measure radiative properties of sunlight to enable the calculation of photolysis frequencies."

The chapters, whose titles are noted below, "... are organized chapterwise according to experimental technique (e.g. absorption, fluorescence, chromatography, mass spectrometry, etc.), rather than by class of species measured."

1. Field measurements of atmospheric composition.
2. Infrared absorption spectroscopy.