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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5 May 2007
Available online 13 May 2007

doi: 10.1016/j.jhazmat.2007.05.021

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.

3. UV-vis differential optical absorption spectroscopy.
4. Fluorescence methods.
5. Mass spectrometric methods for atmospheric trace gases.
6. Mass spectrometric methods for aerosol composition measurements.
7. Chemical methods: chemiluminescence, chemical amplification, electrochemistry, and derivatization.
8. Chromatographic methods.
9. Measurement of photolysis frequencies in the atmosphere.

The editor summarizes (in his introductory chapter) the content of each of the chapters listed above. I have abstracted (and much reduced in length) his descriptions which are as follows:

- Chapter 1 provides an introduction to the determination of atmospheric composition and an overview of the various techniques used to measure trace gases, aerosols, and radiation.
- Chapters 2–4 cover measurement techniques that involve excitation of a molecule to an excited state through absorption of a photon of light.
- Chapter 4 is restricted to the generation of fluorescence via direct optical excitation, rather than fluorescence (chemiluminescence).
- Chapter 5 is dedicated to the monitoring of atmospheric species following their ionization, with selectivity achieved using subsequent separation by mass prior to detection.
- Chapter 6 discusses methods for the measurement of the physical and chemical properties of atmospheric aerosols.
- Chapter 7 describes methods relying on the observation of chemiluminescence.
- Chapter 8 focuses on the separation of analytes and the coupling between chromatographic column and detection system.
- Chapter 9 describes techniques used to determine the rate (or frequency) at which molecules are photo dissociated in the atmosphere.

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3 May 2007
Available online 13 May 2007

doi: 10.1016/j.jhazmat.2007.05.020