BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Positronium and Muonium Chemistry

Editor Hans J. Ache

Publisher The American Chemical Society (1979)

Pages 376

Price $41.00

Reviewer L. B. Church

The symposium "Positronium and Muonium Chemistry" was part of the Second Joint Conference of The Chemical Institute of Canada and the American Chemical Society (ACS) and was held in June 1977. This book is based on this conference, with an addition of several papers from a similar ACS symposium in March 1977.

The objective of these papers is to evaluate the current state-of-the-art of two unique nuclear probes as tools to the chemical environment. Positronium and muonium are short-lived analogs of hydrogen, with a positron (β^+) and a positive muon (μ^+), respectively, taking the place of the proton. Both species decay in <1 μs, although by very different routes: the β^+-e^- pair undergoes self-annihilation while the μ^+ decays to a β^+ and two neutrinos. The exact rates of decay are a strong function of the chemical microenvironment of the positronium or muonium at the time of decay.

Because positronium can easily be made from an in-lab β^+-decaying source (^{22}Na is the most popular), its properties are significantly better understood than muonium, which is dependent on an accelerator for the μ^+. Accordingly, 12 of the 14 chapters (or 270 of the 355 pages) are devoted to the chemistry of positronium. The editor has written an excellent preliminary review of positronium chemistry, where he points out that until around 1970 this field was dominated by scientists trained as physicists. However, as their expertise grew, many chemists became interested in the reactions of these new miniatoms. The backgrounds of these chemists cover all aspects of chemistry: organic to theoretical, biochemistry to solid-state chemistry. All of the major fields are represented in this book.

Many of the common shortcomings present in symposium books are also present here. Because the individual authors cannot know in detail what has been previously covered, the same introductory reviews are often repeated (for example, four presentations of the Ore theory). There is also the usual unevenness in depth of presentation and extent of references (a maximum of 109 and a minimum of 9).

Nonetheless, a nuclear scientist wishing to learn how these nuclear probes are currently being used in chemical systems or a chemist seeking to use or study a somewhat new and exotic, yet very simple, atom would be wise to review this book. It is an important addition to both the nuclear and chemical literature.

Larry B. Church is currently associate professor of chemistry at Reed College and is director of the Reed College Reactor Facility. His current research interests involve simple nuclear reactions produced by pions, protons, and alpha particles and the elemental analysis of impurities in semiconductors.

Flow Visualization

Editor Tsuyoshi Asanuma

Publisher Hemisphere Publishing Corporation, Washington, D.C. (1979)

Pages 413

Price $69.50

Reviewer Clifford J. Cremers

This volume is the proceedings of the International Symposium on Flow Visualization, held October 12-14, 1977, in Tokyo, Japan. The Japanese have had a yearly symposium on flow visualization since 1973, and followed their fifth domestic symposium with the International Symposium on Flow Visualization in 1977.

The volume leads off with four review papers that review recent advances in flow visualization around much of the world. The editor discusses flow visualization tech-

niques in Japan, R. Reznicek discusses flow visualization in Czechoslovakia and some other Eastern European countries, W. Merzkirch discusses flow visualization research in Western Europe, and W.-J. Yang discusses flow visualization studies in the United States and Canada. These review papers cover a wide range of topics and are generously illustrated.

The rest of the volume contains papers in five different areas, two of which ["Tufts and Wall Tracing Methods" (three papers) and "Cavitation" (three papers)] present little of interest to the nuclear engineer. Of the three remaining sections, one is entitled "Direct Injection Methods" (19 papers). Many of these papers describe applications of existing techniques to new problems; however, some techniques new to the reviewer are described. One of interest is the visualization of gas dynamic phenomena and two-phase flow with condensation by R. Conrad, B. Krause, and G. Wortberg. This paper describes utilization of microscopic particles formed in condensation or chemical reactions for the scattering of laser light. Light-section techniques are described that permit the measurement of the local particle size, number density, and the density of carrier gas by measuring intensity of scattered radiation. Another paper by V. Delitzsch and D. W. Schmidt describes a method of flow visualization using optically activated tracers. Here neutrally buoyant particles are made phosphorescent upon illumination by an ultraviolet laser.

Another interesting section concerns "Chemical Reaction and Electrical Control Methods" (10 papers). One new method described here highlights the visualization of slow water flows by the production of a colloidal suspension, which originates at the surface of the test object around which flow occurs. With proper lighting and photography, the integrated streak lines are visualized and can be photographed.

The section on "Optical Methods" (16 papers) I personally found most interesting. In this section, there is a series of three papers each on the application of holographic interferometry and of streaming birefringence. Both of these methods are relatively new and have unique properties that with further development will make them important tools for fluid mechanics experimentalists.

This book, along with *Flow Visualization* by W. Merzkirch [Academic Press, New York (1974)] will be valuable review material for experimentalists seeking to bring themselves up to date on new techniques of flow visualization and applications of many of the old ones.

Clifford J. Cremers did his undergraduate and graduate study in the Department of Mechanical Engineering at the University of Minnesota, where he worked with E. R. G. Eckert. He has subsequently served on the faculties of the Georgia Institute of Technology and the University of Kentucky, where he is presently professor of mechanical engineering and chairman of the department. His research interests include heat transfer in plasma systems, frost formation, and thermophysical property measurement.