

BOOK REVIEW

Mass Spectrometry Study of the Vaporization of Oxide Systems

V. L. Stolyarova and G. A. Sememov
John Wiley & Son, New York, NY
1994, \$85

Book review by Lev Sidorov
Department of Chemistry
Moscow State University
Moscow 119899, Russia

The title of this book is in tune with the content, which is a comprehensive review of the published results in the field of Knudsen cell mass spectrometry and high temperature chemistry of oxides. There are a total of 1251 references. About 30% of them relate to work published before 1980; others relate to 1980–1993 and some references from 1994 also are included. Many of the references have been published in Russian journals, and some are specialized Russian issues that are difficult for Western readers to access. Among such issues, the following items deserve mention: Dep. VINITI (papers deposited in the All-Union Institute of Scientific and Technical Information) abstracts of All-Union conferences, and some books published in Russia and other former Soviet Union countries. All of these sources are written in Russian and have not been translated. The list of references from Western journals (including Japanese) is as comprehensive as the list of Russian literature. The comprehensiveness of the literature citations allows us to conclude that the book provides excellent coverage for scientists working in the field of high temperature oxides.

The first chapter deals with features of the mass spectrometric investigation of vaporization of oxide systems. The following subjects are included: basic principles and equations, sensitivity and dynamic range, heating and temperature measurements, identification of gas-phase species, isothermal evaporation method and methods of comparing ion currents and ion current ratio measurements, vaporization under equilibrium and nonequilibrium conditions, interaction of oxides with cell materials, oxygen partial pressure determination, thermodynamic functions of oxide systems, and transpiration and laser mass spectrometry. This chapter is a good introduction to Knudsen cell

mass spectrometry and is sufficient for understanding in detail the chapters that follow. Chapters 2–6 and 8 represent the results of investigations of particular substances, namely, vapors of oxides salts (Chapter 2), oxide film deposition (Chapter 3), vaporization of refractory components (Chapter 4), vaporization of oxide materials in high temperature processing (Chapter 5), vaporization of oxide glasses and glass-forming melts (Chapter 6), and vaporization of natural oxide systems (Chapter 8). These six chapters are typical review papers. For example, consider Chapter 6, where the points under consideration are vaporization of model glass-forming systems, vaporization of multicomponent commercial glasses, calculation of partial pressures and thermodynamic properties of glass-forming oxide systems, features of the thermodynamic description of the vaporization of oxide melts, and vaporization processes and acid–base interactions in oxide melts. In each case one finds comprehensive coverage of the literature, but encounters only occasionally analysis and discussion. Depth of discussion is not a strong point of these chapters.

Chapter 7, entitled "Ion/Molecular Reactions," is relatively short (16 pages) and does not fall in line with the other chapters. The measurement of equilibrium constants of ion/molecular reactions is the subject of this chapter, which includes measurements in flames and inside the Knudsen cell. Knudsen cell application to the study of ion/molecular equilibrium, especially in the case of negative ions, is a relatively new branch of high temperature mass spectrometry. The authors tried to review this method and present its particular features, but the attempt is not completely successful. Nevertheless, all details and references are given. From another point of view, however, the total picture is diffuse and the guideline is not clear, so a newcomer could get lost in a pile of references. This problem can be clarified by starting with reference 1112. (*Mass Spectrom. Rev.*, 1986, 5, 73–97), where the basic principles of the method are given.

The production quality is exceptional, and the book is remarkably error-free. For scientists working in the field of high temperature chemistry, it is reasonable to have this book in their own or in their institute library. A subject index is included.

BOOK REVIEW

Applications of Plasma Source Mass Spectrometry II

G. Holland and A. N. Eaton, Editors
Royal Society of Chemistry, United Kingdom
1993, 243 pages, £45

Book review by J. W. McLaren
Institute for Environmental Research and Technology
National Research Council of Canada
Ottawa, ON K1A 0R6, Canada

This book is the published Proceedings of the 3rd International Conference on Plasma Source Mass Spectrometry, held in Durham, U.K., September 13–18, 1992. This conference was a forum for discussion of developments in inductively coupled plasma mass spectrometry (ICP-MS) and glow discharge mass spectrometry (GDMS). The 25 papers in the book, published in camera-ready form after review, represent a cross section of the roughly 70 papers and posters presented at the conference. A final chapter, entitled "So Where Do We Go From Here?," presents a retrospective look at the meeting by A. L. Gray, a pioneer in the development of ICP-MS.

The emphasis of the book is very clearly on ICP-MS applications; it contains only two GDMS papers and only two papers that deal with fundamental aspects of either technique. The versatility of ICP-MS for elemental and isotopic analysis is well illustrated by applications from geological, environmental, nuclear, and industrial laboratories. The use of a variety of sample

introduction systems, which include pneumatic nebulizers, ultrasonic nebulizers, flow injection devices, and laser samplers, also is well illustrated.

Given the rapid growth of ICP-MS during the ensuing period, it is inevitable that the book already appears somewhat dated. All but two of the 22 ICP-MS papers report results obtained with either a Perkin-Elmer SCIEX of Fisons/VG instrument, because instruments now commercially available from Finnigan MAT, Thermo Instruments, Hewlett-Packard, and Varian had not been introduced yet. Also, more recent applications involve the use of several sample introduction systems that are not mentioned in this book, which include direct injection nebulizers and electrothermal vaporizers. Differences in editorial style and layout from one chapter to the next are of course much greater than would be the case if the collection of papers had been published as a special issue of a regular journal. This made it harder for this reviewer to scan quickly through a paper to locate details of interest. The short index may be of some help in this regard.

This book provides a worthwhile "snapshot" of the state of the art of plasma source mass spectrometry (particularly ICP-MS) in mid-1992. Many of the authors, the majority of whom work in nonacademic laboratories, have not published extensively. This book therefore provides a slightly different perspective than one gets from reading about ICP-MS applications in the primary literature.