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ing the generation of chemically reactive species. The predominance of neutral atoms and molecules, combined with the attendant myriad of excited states, makes low-temperature plasmas very complicated. Understanding their kinetics is essential to improving and extending their applications.

The book begins with an introductory chapter on basic plasma phenomena, including Debye shielding, equilibrium conditions and transport. The succeeding chapters go on to develop the theme of the book: the elementary collisional and radiative processes that exist in low-temperature nonequilibrium plasmas, and the kinetics that result. The kinetics of the population of excited states, ionization and recombination are considered in detail. One interesting and very useful chapter is on radiative transport. Radiation trapping, which is often important for weakly ionized plasmas, is thoroughly discussed. The electron energy distribution function is derived with the relevant inelastic processes included. The final chapters include brief treatments of transient effects in nonequilibrium plasmas and of the kinetics of molecular plasmas.

The book gives a useful understanding of the fundamental processes that govern low-temperature nonequilibrium plasmas. As such, it would be of value for developing a collisional-radiative model of a plasma or for quantitative spectroscopy. The lack of an index is unfortunate; however, the book contains useful appendices.

A number of topics of practical importance are covered only cursorily or not at all. Topics such as sheath effects and plasma-material interactions, which are important in, for instance, reactive-ion etching, are clearly beyond the scope of this book. Also, very little attention is given to radiofrequency plasma excitation: No specific discharge configurations are discussed.

The book would be a useful reference text for a graduate course in the fundamentals of low-temperature plasmas; the rather abbreviated derivations would make it difficult to use the book as the primary text. The authors make extensive use of energy-space diffusion models to discuss the kinetics of excited states and ionization-recombination. In doing so they provide an excellent physical picture for the onset of the departure from equilibrium in terms of competition among processes. Although the analytical techniques the authors discuss can be quite useful, they largely neglect the more powerful numerical

methods of analysis, which are now relatively easy to implement with the wide availability of computers.

There is much current interest in gaining a better understanding, through diagnostics and modeling, of the plasmas used in various technological applications. Despite some shortcomings, *Kinetics of Nonequilibrium Low-Temperature Plasmas* makes an important contribution toward achieving this objective.

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Laser Analytical Spectrochemistry

Edited by V. S. Letokhov
Adam Hilger, Bristol, UK
(US dist. Taylor and Francis,
New York), 1986 [1985].
412 pp. \$109.00 hc
ISBN 0-85274-568-0

Laser Photoionization Spectroscopy

Vladilen S. Letokhov
Academic, San Diego, Calif.,
1987. 353 pp. \$57.50 hc
ISBN 0-12-444320-6

Photoacoustic and Thermal Wave Phenomena in Semiconductors

Edited by A. Mandelis
North-Holland, New York,
1987. 480 pp. \$75.00 hc
ISBN 0-444-01226-5

The Institute of Spectroscopy of the USSR Academy of Sciences, located in Troitsk, outside Moscow, was established in 1968, and since its inception researchers there have been engaged in the development of new techniques of laser spectroscopy. Important results have been achieved in fields such as hole-burning spectroscopy, laser detection of single atoms and molecules, and laser cooling of atoms. They have had particularly impressive successes in ultrahigh-resolution and ultrasensitive spectroscopies. Based on their successes they have developed analytical methods that use photoacoustics, induced fluorescence and multiphoton resonance coupled to other techniques such as gas chromatography or mass spectrometry.

Laser Analytical Spectrochemistry, edited by Vladilen S. Letokhov, director of the institute, contains eight separately authored chapters presenting tutorial reviews of several laser analytical techniques that were developed at the institute. The book