

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.



Electrical Breakdown and Discharges in Gases— Fundamental Processes and Breakdown

Editors E. E. Kunhardt and L. H. Luessen
Publisher Plenum Publishing Corp.
Pages 466
Price \$65.00
Reviewer J. G. Eden

Although it has been a subject of research for decades, the study of gas discharge phenomena continues to be infused with vitality by the applications of weakly ionized plasmas that arise periodically. The discovery of the laser in the 1960s, for example, prompted an intensive investigation of the collisional and optical properties of low-temperature plasmas that are relevant to laser excitation. In recent years, discharges in attaching gases have attracted attention due to applications of these plasmas in the rapidly growing electronics industry. The progress in the field has created a need for a book that thoroughly reviews the fundamental physics of low-pressure gas discharges, particularly in light of recent experimental results. This book meets such a need.

As noted in the Preface, this volume is a collection of papers presented at a NATO Advanced Study Institute that was held in Les Arcs, France in 1981. The book is divided into five sections: Basic Discharge Processes, Kinetic Theory, Breakdown in Uniform Fields, Breakdown in Nonuniform Fields, and Seminars (special topics). Contributions from well-known workers in the field are included in each section and, with few exceptions, the articles are well organized and clearly written. Particularly noteworthy are the contributions by J. A. Rees (Basic Processes of Electrical Discharges), A. V. Phelps (Transport Data for the Modeling of Electrical Breakdown and Discharges), L. G. Christophorou (Electro-negative Gases), and L. C. Pitchford (A Numerical Solution of the Boltzmann Equation).

A significant fraction of the book is devoted to novel methods for solving Boltzmann's equation for the electron energy distribution function. Also, the discussions of breakdown in the third and fourth sections of the book are well done and provide a good deal of useful data for the student or researcher. The book is well illustrated throughout—a generous amount of space has been devoted to individual figures and each one is amply and legibly labeled.

One shortcoming is the lack of attention given to heavy particle collisions in these plasmas. Although electron-heavy

particle collisions arguably dominate the behavior of low-pressure plasmas, collisions between two heavy particles, for example, play important roles in laser and lamp plasmas. Finally, the length of time required to publish the volume prevents some of the material from being as timely as one would hope.

Overall, though, the book is excellent, and it is this reviewer's opinion that it should be in the personal library of researchers and graduate students in the field.

J. Gary Eden received his BS in electrical engineering from the University of Maryland in 1972. He later received both the MS and PhD degrees (again, in electrical engineering) from the University of Illinois (UI) in 1973 and 1976, respectively. Dr. Eden was awarded a National Research Council Postdoctoral Research Associateship at the Naval Research Laboratory (NRL) in 1975. In November 1976, Dr. Eden joined the staff of the Laser Physics Branch of NRL. During his tenure there, he made several contributions to the area of visible and ultraviolet lasers and gas phase laser spectroscopy.

Since joining the faculty of the UI in 1979, Dr. Eden has been involved in research involving semiconductor film growth and nonlinear atomic and molecular spectroscopy using excimer lasers. Recent work has included a microwave approach to measuring absolute photoionization cross sections in the rare gases and the first optically pumped rare gas laser. He has directed a research team that demonstrated the growth of semiconductor and metal films by laser photodissociation and photoionization techniques.

Fusion: An Introduction to the Physics and Technology of Magnetic Confinement Fusion

Author Weston M. Stacey, Jr.
Publisher John Wiley & Sons, Inc.
Pages 255
Price \$39.95
Reviewer Robert G. Mills

Weston M. Stacey, Jr., a professor of nuclear engineering at Georgia Institute of Technology, has a fine background in the subject matter of this book (having led the American effort to develop the conceptual design of the