Atomic and Molecular Processes in Controlled Thermonuclear Fusion

Editors	M. R. C. McDowell and A. M. Ferendeci
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Reviewer	A. A. Harms

The early literature on fission made it appear that this new source of energy could be made available primarily on the basis of the use of selected aspects of available neutron physics, the assembly of appropriate hardware components, and an elementary knowledge of primarily one fission reaction. Subsequent experience has shown the very extensive body of additional and specialized knowledge that had to be acquired before a fission reactor could serve as a reliable source of energy. Similarly, much of the literature on fusion energy to date seems to suggest that the attainment of controlled thermonuclear energy requires only an understanding of selected aspects of plasma physics, some knowledge of hardware and diagnostics, and the identification of one fusion reaction. The above book is a contribution to an increasingly important field of fusion science. It illustrates the broader perspective necessary in the continuing evolution of fusion science and technology.

As the title of the book suggests, it is devoted to processes relevant to fusion energy other than fusion reactions; its domain of relevance, however, is primarily restricted to magnetic confinement in general and tokamak devices in particular. It contains a selection of 16 papers presented at a conference in August 1979 under the auspices of North Atlantic Treaty Organization Advanced Study Institute and published as Vol. 53 in its series. Some 100 scientists attended this specialist conference.

The first five papers in this book are introductory and provide for a comprehensive circumscription of atomic and molecular processes as presently perceived in tokamak fusion devices. Selected topics of fusion system design, plasma physics, energy balances, and fusion processes are effectively treated with generally little overlap.

The next five papers deal with theoretical aspects of processes such as atomic collisions, charge-exchange, ionization, electron impact, and recombination. Here, the level of presentation is largely directed to the specialist on the subject.

The subsequent set of three papers presents experimental techniques and measurement of electron-atom collisions, electron capture, energy level measurement, and related experimental objectives. Considerable stress is placed on the explanation of facilities and discussion of experimental results.

The remaining three papers address themselves to a discussion of hot plasma spectra, helium dynamics, and related topics.

It is a credit to the editors of this volume that the conventional criticism of conference proceedings—such as unevenness of style and level of emphasis—cannot be made with much force here. Though the authors represent diverse national and scientific orientation, there exists a remarkable continuity of information content, format, figures (they are clear black line drawings), length (20 to 60 pages), well referenced (up to 121 in one case), and generally current (up to 1979). An unexpected feature for a conference proceedings volume is the inclusion of an index. The text is a reproduction of typed manuscripts. Though one may well question the need for the same graphical information displayed three times (pages 3, 110, and 122 with some slight variation), the texts seem to be generally free of errors and logically well constructed. The editors, M. R. C. McDowell from the University of London (United Kingdom) and A. M. Ferendeci from Bogazici University (Turkey) and Case Western Reserve (United States), deserve credit for this excellent conference proceedings issue.

This book is clearly directed to those nuclear physicists and nuclear engineers who by practice or interest could benefit from an increased familiarization with atomic and molecular processes in fusion reactors. Considering the increasing emphasis on plasma impurities and first-wall interaction, it is evident that it is a timely publication; the choice of papers and the style of presentation suggest its likely utility.

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The research interests of Professor Harms are in the general area of fusion/fission/spallation nuclear energy systems and neutron diagnostics. He has published extensively in the scientific literature and has lectured at various research institutes and universities in Europe, the United States, and Canada. He has served as a consultant to several industrial-institutional organizations, including the International Atomic Energy Agency. Dr. Harms is a former chairman of the Department of Engineering Physics at McMaster University and is licensed as a professional engineer.

A Guidebook to Nuclear Reactors

Author	Anthony V. Nero, Jr.
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Reviewer	Kermit L. Garlid

This book, now in print for more than two years, has been a pleasure to read and review. It is an attractive, concise introduction to the most important types of nuclear reactors, the fuel cycles that surround them, and the implications of alternative systems with respect to resource