Kinetics of a nonequilibrium molecular gas

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Usp. Fiz. Nauk 155, 545 (July 1988)

Nonequilibrium Vibrational Kinetics. Ed. M. Capitelli, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo (1986) pp. 344. (Topics in Current Physics/ Founded by H.-K. von Lotsch. V. 39).

A molecular gas at low and medium pressure excited by an external source in a nonequilibrium manner has a nonequilibrium occupancy of the vibrational degrees of freedom. This occurs, for example, in a gas-discharge plasma and, in particular, in molecular mixtures of gas lasers. The nonequilibrium distribution in the molecular gas determines the kinetics of the processes in it and affects the yield parameters of systems containing a molecular gas. The understanding of this fact led to the creation in the sixties and seventies of the theory of a nonequilibrium molecular gas. A large contribution to the development of this theory was made by the editor of the present collection of articles, Prof. M. Capitelli (Italy). During the years gone by the theory of a nonequilibrium molecular gas has acquired a finished form: debatable points have been resolved, as a result of its interaction with experiment the theory has got rid of unnecessary elements, and has been utilized for the solution of different applied physics problems. The present book reflects the present state of the physics of a nonequilibrium molecular gas.

Without listing the authors of the individual articles in the book (among them there are several Soviet scientists), I shall mention the principal problems discussed in the book. They are the vibrational kinetics of a gas of diatomic and polyatomic molecules, the investigation of the processes of dissociation, ionization, dissociative attachment, excitation of electronic and vibrational levels, and also of chemical processes in a nonequilibrium molecular gas. At the same time and on the basis of the above discussion the following topics are examined: applied problems of a nonequilibrium molecular gas—plasma-chemical processes, processes in chemical lasers and in the plasma of molecular lasers, instabilities in the case of excitation of molecular gases by different means, separation of isotopes in molecular gases, etc.

The book provides a complete physical picture of processes in a nonequilibrium molecular gas, and contains a description of the physical and applied aspects of this problem. It contains up-to-date information on the physical kinetics of a nonequilibrium molecular gas. Therefore the book will be useful to a wide range of specialists both in terms of the information contained in it, and of the physical concepts and approaches that underlie the analysis of a given problem.

Lectures on the application of multiple scattering theory in calculations of the electronic structure of solids

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Usp. Fiz. Nauk 155, 546-547 (July 1988)

I. Moertig, E. Mrosan, and P. Ziesche. Multiple Scattering Theory of Point Defects of Metals: Electronic Properties; Teubner, Leipzig (1987) pp. 220 (Teubner Texte zur Physik. Bd. 11).

The book under review is the eleventh volume of the series "Teubner Lectures in Physics" published in the GDR. It has been written by members of the "Dresden group on electron theory" at the Technical University of Dresden who have for a long time and actively carried out calculations of the electron structure and electron properties of solids. This has left its imprint on the book: one feels the practical approach, the authors do not neglect presentation of technical details, methodologies, etc.

It must be said that calculations of the electron structure of disordered bodies and crystals with impurities have been developing very actively recently. The time is now ripe to have a book that presents in a consistent manner the theoretical bases of such calculations. Until very recently there has been only one publication devoted to these problems the well known book of Ehrenreich and Schwarz (1976) translated into Russian in 1979. However in this book the presentation is primarily from the point of view of strong