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Atomic Particles and Atom Systems

Data for Properties of Atomic Objects and Processes

Second Edition

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Preface

This book is devoted to atomic particles and processes involving atomic particles. It contains, on the one hand, numerical data for atoms, molecules, ions and processes with participation of electrons, ions, atoms and molecules. On the other hand, this book represents basic concepts and simple models for atomic particles and atomic processes. Numerical data are given in various forms including periodical tables of elements with filling by certain parameters of elements, atoms, molecules or processes, spectra of atoms, potential curves for electron terms of molecules, conversion factors for units used in formulas of atomic physics, tables and figures with certain atomic parameters. This information is joined with simple models for atomic particles and atomic processes.

Interaction inside atoms and between individual atomic particles is the basis of models described the nature of atomic particles and processes under consideration. Namely, electron terms of an atom follow from the exchange interaction of electrons inside an atom due to the Pauli exclusion principle, and the relation between exchange and spin–orbit interactions determines the atom coupling scheme, as well as atom quantum numbers. Comparison of the electrostatic and exchange interaction potential in a molecule with that of relativistic interactions gives molecular quantum numbers in accordance with the Hund's cases of momentum coupling. Interaction of atomic particles determines their dynamics, i.e. cross sections of their scattering in collisions. In turn, transport of atomic particles in gases and plasmas results from collisions of atomic particles, and, hence, transport coefficients are expressed through cross sections of collisions of atomic particles. Moving according to this scheme from atoms to molecules, from statics to dynamics, we add models and concepts with numerical data on each stage of consideration.

This book may be useful as an addition to contemporary books on atomic physics. Since the author collected and selected the content of this book in its practical work, it is directed to active specialists including advanced students who can use this material for the analysis of a certain physical situation.

Moscow, Russia — Boris M. Smirnov

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