



Molecular Processes in Plasmas: Collisions of Charged Particles with Molecules (Springer Series on Atomic, Optical, and Plasma Physics)

By Yukikazu Itikawa

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A variety of plasmas include molecules rather than only ions or atoms. Examples are ionospheres of the Earth and other planets, stellar atmospheres, gaseous discharges for use in various devices and processes, and fusion plasmas in the edge region. This book describes the role of molecules in those plasmas by showing elementary collision processes involving those molecules.

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Editorial Review

From the Back Cover

Molecular Processes in Plasmas describes elementary collision processes in plasmas, particularly those involving molecules or molecular ions. Those collision processes (called molecular processes) maintain plasmas, produce reactive species and emissions, and play a key role in energy balance in plasmas or more specifically in determining the energy distribution of plasma particles. Many books on plasma physics mention the elementary processes, but normally rather briefly. They only touch upon the general feature or fundamental concept of the collision processes. On the other hand, there are many books on atomic and molecular physics, but most of them are too general or too detailed to be useful to people in the application fields. The present book enumerates all the possible processes in the collisions of electrons, as well as ions, with molecules. For each process, a compact but informative description of its characteristics is given together with illustrative examples. Since the author has much experience as a practitioner in the field of atomic and molecular physics, the description is based on a thorough and up-to-date knowledge of the processes.

About the Author

The author graduated from the Physics Department, University of Tokyo. As a PhD thesis, he studied the theoretical plasma physics. He has been working at the Institute of Space and Astronautical Science (before the organizational change in 1982, the Institute of Space and Aeronautical Science, University of Tokyo) for more than thirty years. He is now the professor emeritus at the Institute. His main interest is in the theoretical atomic and molecular physics, particularly on the electron or photon collisions with molecules. He is also interested in the application of the atomic and molecular physics to other fields (space science, plasma physics, radiation interaction with matter, etc.). He has personally organized an activity of compilation of cross section data. He published, with his colleagues, data reviews on electron collisions with molecules such as N₂, O₂, CO₂, and H₂O. He served as the editor of the volume of the Landolt Börnstein series on electron/photon collisions with atoms, molecules, and ions.

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