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Collision Cross-section; 2.3 Inelastic Collision Processes; 2.3.1 Excitation; 2.3.1.1 Metastable Processes; 2.3.2 Ionization and Recombination Processes; 2.3.2.1 Charge Transfer; 2.3.2.2 Dissociation; 2.3.2.3 Negative Ionization; 2.3.2.4 Recombination; 2.3.2.5 Metastable Ionization; References; 3 The Interaction of Electromagnetic Fields with Plasmas; 3.1 Introduction 3.2 The Behaviour of Plasmas at DC and Low Frequencies in the Near Field 3.2.1 Charged Particles in Electromagnetic Fields; 3.2.1.1 Behaviour of a Charged Particle in an Oscillating Electric Field; 3.2.1.2 Plasma Frequency; 3.2.1.3 The Debye Radius; 3.3 Behaviour of Charged Particles in Magnetic Fields (Magnetized Plasmas); 3.4 Initiation of an Electrical Discharge or Plasma; 3.5 Similarity Conditions; References; Further Reading; 4 Coupling Processes; 4.1 Introduction; 4.2 Direct Coupling; 4.2.1 The Cathode; 4.2.1.1 Emission Processes; 4.2.2 The Cathode Fall Region; 4.2.3 The Anode 4.2.4 The Discharge Column 4.2.5 Interaction of Magnetic Fields with a Discharge or Plasma; 4.3 Indirect Coupling; 4.3.1 Induction Coupling; 4.3.2 Capacitive Coupling; 4.3.3 Propagation of an Electromagnetic Wave; 4.3.4 The Helical Resonator; 4.3.5 Microwave Waveguides; 4.3.6 Electron Cyclotron Resonance; 4.3.7 The Helicon Plasma Source; References; Further Reading; 5 Applications of Nonequilibrium Cold Low-pressure Discharges and Plasmas; 5.1 Introduction; 5.2 Plasma Processes Used in Electronics Fabrication; 5.2.1 The Glow Discharge Diode; 5.2.2 The Magnetron 5.2.3 Inductively Coupled Plasmas 5.2.4 Electron Cyclotron Resonance Reactor; 5.2.5 The Helical Reactor; 5.2.6 The Helicon Reactor; 5.3 Low-pressure Electric Discharge and Plasma Lamps; 5.3.1 The Low-pressure Mercury Vapour Lamp; 5.3.2 Cold Cathode Low-pressure Lamps; 5.3.3 Electrodeless Low-pressure Discharge Lamps; 5.4 Gas Lasers; 5.5 Free Electron and Ion Beams; 5.5.1 Electron and Ion Beam Evaporation; 5.5.2 Ion Beam Processes; 5.5.3 High-power Electron Beams; 5.6 Glow Discharge Surface Treatment; 5.7 Propulsion in Space; References; Further Reading 6 Nonequilibrium Atmospheric Pressure Discharges and Plasmas

Sommario/riassunto

Written by a university lecturer with more than forty years experience in plasma technology, this book adopts a didactic approach in its coverage of the theory, engineering and applications of technological plasmas. The theory is developed in a unified way to enable brevity and clarity, providing readers with the necessary background to assess the factors that affect the behavior of plasmas under different operating conditions. The major part of the book is devoted to the applications of plasma technology and their accompanying engineering aspects, classified by the various pressure and de