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3.2. Optical emission spectrum3.3. Spatial distribution of delayed continuum emission; 4. Spatiotemporal Variations of C2 and C3 Radical Densities [Sasaki et al. (2002)]; 4.1. C2 and C3 radical densities in vacuum; 4.2. C2 and C3 radical densities in ambient He gas at 1 Torr; 4.3. C2 and C3 radical densities in ambient He gas at 5 Torr; 5. Temporal Change in the Total Numbers of C2 and C3; 6. Spatiotemporal Variation of Plume Temperature [Sasaki and Aoki (2008)]; 6.1. Evaluation of plume temperature; 6.2. Spatial distribution of plume temperature; 6.3. Temporal variation of plume temperature
7. A Scenario for the Growth of Carbon Clusters8. Conclusions; References; Chapter 3 Kinetic and Diagnostic Studies of Carbon Containing Plasmas and Vapors Using Laser Absorption Techniques; 1. Introduction; 2. Plasma Chemistry and Reaction Kinetics; 2.1. General considerations; 2.2. Molecular microwave plasmas containing hydrocarbons; 3. Gas-Phase Characterization in Diamond Hot-Filament CVD; 4. Kinetic Studies and Molecular Spectroscopy of Radicals; 4.1. Line strengths and transition dipole moment of CH3; 4.2. Molecular spectroscopy of the CN radical
5. Quantum Cascade Laser Absorption Spectroscopy for Plasmas Diagnostics and Control5.1. General considerations; 5.2. Trace gas measurements using optically resonant cavities; 5.3. In situ monitoring of plasma etch processes with a QCL arrangement in semiconductor industrial environment; 6. Summary and Conclusions; Acknowledgements; References; Chapter 4 Spectroscopy of Carbon Containing Diatomic Molecules; 1. Introduction; 1.1. Differences between atomic and diatomic spectra; 1.2. The line strength; 2. Diatomic Quantum Theory; 2.1. Diatomic eigenfunctions; 2.2. Diatomic parity
2.3. Homonuclear diatomics2.4. Born-Oppenheimer approximation; 2.5. Hund's angular momentum coupling cases; 3. The Diatomic Hamiltonian; 3.1. The rotational Hamiltonian; 3.2. The fine structure Hamiltonian; 3.3. Hamiltonian matrix elements in Hund's case (a); 3.4. Centrifugal corrections to molecular parameters; 4. Finding the Molecular Parameters by Fitting a Measured Spectrum; 4.1. Example of a spectrum fit; 5. Diatomic Line Strengths in the Case (a) Basis; 5.1. RKR potentials and vibrational eigenfunctions; 5.2. Computation of the diatomic line strength
6. Example Applications of Line Strengths

Sommario/riassunto

This book is a stop-gap contribution to the science and technology of carbon plasmas and carbon vapors. It strives to cover two strongly related fields: the molecular quantum theory of carbon plasmas and carbon nanostructures; and the molecular and atomic spectroscopy of such plasmas and vapors. These two fields of research are strongly intertwined and thus reinforce one another. Even though the use of carbon nanostructures is increasing by the day and their practical uses are emerging, there is no modern review on carbon plasmas, especially from molecular theoretical and spectroscopic viewpoi