

CONTENTS

Preface	xi
---------	----

OVERVIEW

1. Lasers, Chemistry, and Combustion	3
2. Laser Probes for Combustion Applications	19

LASER-INDUCED FLUORESCENCE : MOLECULES

3. Laser-Induced Fluorescence Spectroscopy in Flames	61
4. Laser Probes of Premixed Laminar Methane-Air Flames and Comparison with Theory	85
5. Laser-Induced Fluorescence : A Powerful Tool for the Study of Flame Chemistry	103
6. Laser-Induced Fluorescence Spectroscopy Applied to the Hydroxyl Radical in Flames	131
7. A Multilevel Model of Response to Laser-Fluorescence Excitation In the Hydroxyl Radical	137
8. Saturated-Fluorescence Measurements of the Hydroxyl Radical	145
9. Nitric oxide Detection in Flames by Laser Fluorescence	153
10. Laser-Induced Fluorescence of Polycyclic Aromatic Hydrocarbons in Flame	159
11. Flow Visualization in Supersonic Flows	167

LASER-INDUCED FLUORESCENCE : ATOMS

12. What Really Does Happen to Electronically Excited Atoms in Flames?	175
13. Collisional Ionization of Sodium Atoms Excited by One- and Two-Photon Absorption in a Hydrogen-Oxygen-Argon Flame	183
14. On Saturated Fluorescence of Alkali Metals in Flames	189
15. Saturation Broadening in Flames and Plasmas as Obtained by Fluorescence Excitation Profiles	195
16. Determination of Flame and Plasma Temperatures and Density Profiles by Means of Laser-Excited Fluorescence	199

SPONTANEOUS RAMAN SCATTERING

17. Raman-Scattering Measurements of Combustion Properties	207
18. Temperature from Rotational and Vibrational Raman Scattering : Effects of Vibrational-Rotational Interactions and Other Corrections	231
19. Temperature-Velocity Correlation Measurements for Turbulent Diffusion Flames from Vibrational Raman-Scattering Data	239
20. Observations of Fast Turbulent Mixing in Gases Using a Continuous-Wave Laser	247
21. A Nd:YAG Laser Multipass Cell for Pulsed Raman-Scattering Diagnostics	255
22. Time-Resolved Raman Spectroscopy in a Stratified-Charge Engine	259
COHERENT RAMAN SPECTROSCOPY	
23. Spatially Precise Laser Diagnostics for Practical Combustor Probing	271
24. CARS Measurements in Simulated Practical Combustion Environments	303
25. Update on CARS Diagnostics of Reactive Media at ONERA	311
26. The Application of Single-Pulse Nonlinear Raman Techniques to a Liquid Photolytic Reaction	319
MODELLING AND KINETICS	
27. Detailed Modelling of Combustion : A Noninterfering Diagnostic Tool	311
28. Rate of Methane Oxidation Controlled by Free Radicals	357
29. The Detailed Modelling of Premixed, Laminar, Steady-State Flames. Results for Ozone	365
30. On the Rate of the $O + N_2$ Reaction	375
31. Reactions of C_2 ($X^1 \Sigma_g^+$) and ($a^3 \Pi_u$) Produced by Multiphoton UV Excimer Laser Photolysis	381
32. Pulsed-Laser Studies of the Kinetics of C_2O ($A^3 \Pi_1$ and $X^3 \Sigma^-$)	389
33. Kinetics of CH Radical Reactions Important to Hydrocarbon Combustion Systems	397
34. Carbon Monoxide Laser Resonance Absorption Studies of 1-Alkynes and Methylene Radical Reactions	403

OTHER DIAGNOSTIC TECHNIQUES

35. Absorption Spectroscopy of Combustion Gases Using a Tunable IR Diode Laser	413
36. Multiangular Absorption Measurements in a Methane Diffusion Jet	427
37. Temperature Measurement in Turbulent Flames Via Rayleigh Scattering	435
38. Droplet-Size Measurements in Reacting Flows by Laser Interferometry	443
39. Continuous-Wave Intracavity Dye Laser Spectroscopy : Dependence of Enhancement on Pumping Power	451
40. The Use of Photoacoustic Spectroscopy to Characterize and Monitor Soot in Combustion Processes	457
Index	463