



Spectroscopy and Optical Diagnostics for Gases

By Ronald K. Hanson, R. Mitchell Spearrin, Christopher S. Goldenstein

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This text provides an introduction to the science that governs the interaction of light and matter (in the gas phase). It provides readers with the basic knowledge to exploit the light-matter interaction to develop quantitative tools for gas analysis (i.e. optical diagnostics) and understand and interpret the results of spectroscopic measurements. The authors pair the basics of gas-phase spectroscopy with coverage of key optical diagnostic techniques utilized by practicing engineers and scientists to measure fundamental flow-field properties. The text is organized to cover three sub-topics of gas-phase spectroscopy: (1) spectral line positions, (2) spectral line strengths, and (3) spectral lineshapes by way of absorption, emission, and scattering interactions. The latter part of the book describes optical measurement techniques and equipment. Key subspecialties include laser induced fluorescence, tunable laser absorption spectroscopy, and wavelength modulation spectroscopy. It is ideal for students and practitioners across a range of applied sciences including mechanical, aerospace, chemical, and materials engineering.

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Editorial Review

From the Back Cover

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About the Author

Ronald K. Hanson is the Woodard Professor of Mechanical Engineering at Stanford University. Prof. Hanson has been actively involved in teaching and applied spectroscopy research at the High Temperature Gasdynamics Laboratory at Stanford for over 40 years, resulting in over 95 Ph.Ds being awarded under his supervision. The Hanson research group has published over 1000 technical papers, contributing to many advances in optical diagnostics, and also shock wave physics, chemical kinetics, combustion science and advanced propulsion. Co-authors Dr. Mitchell Spearrin and Dr. Christopher Goldenstein are former students of Prof. Hanson's research group.

R. Mitchell Spearrin is an Assistant Professor of Mechanical and Aerospace Engineering at the University of California Los Angeles (UCLA). Prof. Spearrin's research focuses on spectroscopy and optical sensors with experimental application to dynamic flow fields in aerospace, energy, and biomedical systems.

Christopher S. Goldenstein is an Assistant Professor of Mechanical Engineering at Purdue University. Prof. Goldenstein's research focuses on the development and application of laser-based sensors for studying energetic materials, energy systems, and trace gases.

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