

Combustion Science and Technology Book Series

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Volume 3

LASER DIAGNOSTICS FOR COMBUSTION TEMPERATURE AND SPECIES

Second Edition

Alan C. Eckbreth

The first edition of this book immediately became a reference tool for researchers in the rapidly developing field of diagnostics. Therefore, the second edition is a welcomed volume which incorporates the newest developments into a familiar framework.

—Richard B. Miles

Professor of Mechanical and Aerospace Engineering, Princeton University

Laser approaches to combustion diagnostics are of considerable interest due to their remote, non-intrusive and *in-situ* character, unlimited temperature capability and potential for simultaneous temporal and spatial resolution. This book aims to make these powerful and important new tools in combustion research understandable. The focus of this text is on spectroscopically based, spatially precise laser techniques for temperature and chemical composition measurements in reacting and non-reacting flows. Following introductory chapters on basic spectroscopy, laser physics, experimental methods and practical considerations, each of the major techniques is treated in some detail replete with measurement examples and references. These include spontaneous Raman and Rayleigh scattering, coherent anti-Stokes Raman spectroscopy (CARS), laser-induced fluorescence (LIF) and degenerate four wave mixing (DFWM). The text concludes with a treatment of field methods in which the various techniques are employed to perform measurements simultaneously over a two-dimensional slice of the medium being probed.

About the author

Alan Eckbreth received a B.S. in engineering physics from Lehigh University in 1964 and four years later received his Ph.D. in aerospace and mechanical sciences from Princeton University. He also holds an M.S. in administrative sciences from Rensselaer Polytechnic Institute (1976). In 1968, he joined United Technologies Research Center, East Hartford, Connecticut, where he is currently assistant director of research for chemical sciences. Most of his technical career has been spent in the development and application of nonintrusive laser diagnostics to practical combustion systems. He is the author of over sixty technical papers and has traveled extensively as a guest lecturer and seminar speaker. He holds six patents and is a Fellow of both the Optical Society of America and the American Institute of Aeronautics and Astronautics. He is a member of the U.S. Air Force Scientific Advisory Board and the Connecticut Academy of Science and Engineering. He has run the Boston Marathon ten times.

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