

Laser applications to chemical and environmental analysis: introduction to the feature issue

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This issue of *Applied Optics* features 16 papers describing chemical and environmental measurements made possible by lasers. Many of these contributions were presented at the Optical Society of America Topical Meeting on Laser Applications to Chemical and Environmental Analysis, held in Orlando, Florida, 9–11 March 1998. © 1999 Optical Society of America
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Modern lasers have a wide and growing applicability to problems in chemical and environmental analysis. In 1987 a series of Optical Society of America topical meetings was inaugurated to bring together laser technologists and application practitioners to promote development of new chemical measurement techniques exhibiting enhanced selectivity or sensitivity, or both. The sixth meeting in this series was held in Orlando, Florida 9–11 March 1998. Forty-four oral presentations and 28 posters were included. Approximately 90 participants attended, and several laser and optics vendors displayed their products. Meeting symposia included laser applications in microanalytical systems, ultrasensitive detection of biologically important species, surface spectroscopy and analysis, advances in diode laser sources and applications, environmental remediation and monitoring, fluorescence spectroscopy in condensed media, and combustion diagnostics.

Recent developments in laser technology have stimulated additional growth in this field. In particular, lasers now are often smaller, more reliable, more user friendly, and less expensive than systems of a few years ago. Tunable, semiconductor diode lasers that operate at room temperature are a dramatic example of this

trend. Four contributions in this issue describe advances in tunable infrared laser sources for spectroscopy, including new laser designs and nonlinear optical methods for difference frequency generation. Combustion diagnostics remains a mainstay of the laser applications to chemical and environmental analysis (LACEA) program, and four papers outline applications concerning flame thermometry by laser-induced fluorescence (LIF), quantification of LIF, a cavity ringdown method for soot determination, and spatially resolved absorption spectroscopy in an engine.

Environmental measurements reported here include LIF and diffuse reflectance spectroscopy of Diesel fuel-contaminated soil, a photofragmentation LIF method for explosives in soil and ground water, and minority species detection in aerosols by anti-Stokes Raman scattering. Industrial and military laser applications include continuous emission metals monitoring by laser-induced breakdown spectroscopy, gas temperature measurements in industrial furnaces, and analysis of fire suppressants and refrigerants by laser-induced breakdown spectroscopy. Ultrasensitive detection and surface analysis contributions in this issue concern single molecule analysis in guided droplet streams (see the issue cover and description) and laser desorption mass spectrometry for surface lithium contamination.

The LACEA meetings are a valuable forum for bringing together researchers from a wide range of backgrounds to share ideas and developments, as witnessed by the contributions to this feature issue. A seventh LACEA topical meeting is planned for 2000. The feature editors gratefully acknowledge the contributions of the authors and the efforts of the referees who helped meet the deadlines associated with this issue. We especially thank Alexine Moore of the *Applied Optics* manuscript office for her assistance in expediting the manuscript review process.

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