

Introduction

This special technical publication, resulting from the ASTM sponsored symposium on Advances in Luminescence Spectroscopy held at the 1983 Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, represents an ongoing effort by the ASTM to acquaint the scientific community with some of the most recent advances in fluorescence and phosphorescence research. It represents, together with its companion publication, *New Directions in Molecular Luminescence* (STP 822, 1983), an overview of the major research areas challenging the present day spectroscopist. The scope is diverse, with coverage of new instrumentation, studies of fundamental photophysical phenomena, and analytical applications. The surge in luminescence research in recent years, along with the coupling of luminescence measurements with other techniques, such as chromatography and antibody/antigen reactions, requires a continuous dissemination of recent fundamental discoveries and uses of luminescence spectroscopy. Part of the responsibilities of the ASTM Subcommittee E13.06 on Molecular Luminescence is to facilitate access to these latest advances in analytical, physical, and biochemistry relating to fluorescence/phosphorescence. The functions of the E13.06 Subcommittee, as part of Committee E-13 on Molecular Spectroscopy, extends beyond this to formulating standard methods and practices, reference standards, definitions, and conducting round-robin testing. The work of the committee is done by committed, volunteer experts working in the area of molecular luminescence in institutions throughout the world, and it is hoped that this volume will attract many of its readers to join the subcommittee in these efforts.

The 1983 symposium was designed to complement the first one held in 1982 by including new topics and speakers whose work had not been published in the first volume. A large number of research areas had not been included in the first symposium because of space/time constraints, and the present volume attempts to expand coverage to areas not included previously, as well as include new areas that have emerged since 1982. One general area covered here by four papers is microenvironmental effects on luminescence properties. The often subtle effects of the immediate chemical environment of lumiphors can produce dramatic changes in the spectroscopic observables, as illustrated by studies of solvation interactions, rapid intramolecular proton transfer sensitive to hydrogen-bonding impurities, rotations in proteins, and induction of phosphorescence at ambient temperature. The second area concerns more indirect probes of luminescence using photoacoustic spectroscopy and immobilized fluorescent ligands. A third area covered involves transformation of hazardous chemical luminescence spec-

tral data by synchronous excitation fluorescence and pattern recognition. Taken as a body, these papers reveal the rich diversity of research interests and applications in luminescence spectroscopy, collected for the reader by the ASTM into one convenient source.

Much work remains to be done to meet the creative challenges in the development of a better understanding of the interaction of light with molecules. Scientists, working individually in industry, government, and academia and collectively at the ASTM, are diligently seeking a better understanding of these interactions and ways to translate this understanding for practical use, aided by new computer-assisted instrumentation, theories, and methodologies. The ASTM Subcommittee E13.06 on Molecular Luminescence stands ready to contribute to these efforts by providing a common language and forum to help merge this diverse body of knowledge into a convenient, focused form.

In dedicating this volume to the memory of Prof. Gordon F. Kirkbright, we pay tribute to the scholar and to the man who was a generous, concerned friend to both of us. We join in expressing our sympathies to his wife Ann and two children, Suzanne and Clare.

Acknowledgment

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