

BOOK REVIEW

LUMINESCENCE TECHNIQUES IN CHEMICAL AND BIOCHEMICAL ANALYSIS

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Pub: Marcel Dekker, New York 1991, pp 680 bound and illustrated

Price US \$150 (USA and Canada); US \$180 (Other countries)

ISBN 0-8247-8369-7

The detection and measurement of light offers an alternative to the use of radioactivity and undoubtedly analysis by applications of luminescence techniques is one of the fastest-growing topics in analytical chemistry. Coupled with the use of enhancers, luminescence rivals the very high sensitivity achieved with radioactivity detection. This text is Volume 12 of the Practical Spectroscopy Series and consists of 19 Chapters written by 50 expert contributors in the field.

Chapter 1 provides a short overview of the potential of luminescence analysis. Following Chapters 2,3 and 4 mainly on basic theoretical aspects of fluorescence, Chapter 5 gets into the more practical applications of fluorogenic reagents and fluorescent probes. Included are uses of fluorescence in HPLC, TLC, fluoroimmunoassay and in the study of proteins, enzymes and other macromolecular structures. Chapter 5 has also a useful comprehensive review of fluorescent probes most frequently used in quantitative analysis.

Chapter 6 focusses on the instrumentation and applications of frequency-domain fluorescence spectrometry and compares this with time-domain fluorometry. Circularly polarised luminescence studies of chiral lanthanide complexes are discussed in Chapter 7. An interesting account of bioanalytical applications of fluorescence line-narrowing spectrometry (FLNS) is provided in Chapter 8. Highlighted is the potential advantage for utilizing FLNS and ^{32}P -(or ^{35}S -) postlabelling as complementary methods for the detection and identification of DNA adducts. The advantages of Laser-Induced fluorescence detection of analytes is discussed in Chapter 9. This latter Chapter has also an excellent section on the basic concepts of lasers and the various types of lasers, which is especially useful to those new to the subject. A useful table included lists fluorophores applicable for laser-induced fluorescence (LIF) detection together with some useful tips on pitfalls using LIF in liquid chromatography. The final section of Chapter 9 lists Laser-induced fluorescence detection of polynuclear aromatic hydrocarbons which leads nicely into Chapter 10 on the applications of luminescence techniques in studies of polycyclic carcinogen - nucleic acid interactions, including the important role of polycyclic aromatic diol epoxides.

Fluorescence immunoassays are rapidly gaining significance over traditional immunoassays and are reviewed in detail in Chapter 11. Tables are included listing analytes measured by homogeneous fluorescence immunoassays and by chemiluminescence and bioluminescence methods. Separation systems used in heterogeneous fluorescence immunoassays are also listed in tabular form. Reference is made to amplification of the signals but this is dealt with more extensively in the final Chapter 19. Basic theory and current status of total luminescence spectrometry for biomedical sciences are included in Chapter 12. Potential uses in non-biomedical applications such as in identification of crude oils (for oil spills) is also mentioned. Instrumentation and applications of fluorescence-detected circular dichroism in biomedical analysis such as molecular conformation and binding, is reviewed in Chapter 13. Methods available for the cleanup of

samples for liquid chromatography prior to spectroscopic detection of bioactive substances and drugs in biological materials, are described in Chapter 14. A useful table is included which lists the various types of extraction packings available for Bond Elut cartridges.

Chemiluminescence immunoassays in veterinary and food analysis are reviewed in Chapter 15 while Chapter 16 focusses specifically on the synthesis, chemiluminescence and stability of acridinium ester labelled compounds. Analytical chemiluminescence in flow injection systems, in high performance liquid chromatography and other flow systems is reviewed in Chapter 17. Although known for over 90 years, only recently have the 1,2-dioxetanes found routine practical applications. The luminescent and non-luminescent decomposition and chemistry of this interesting class of compounds, along with their potential applications, are reviewed in Chapter 18. The final Chapter 19 of the text appropriately reviews enhanced chemiluminescence detection of horseradish peroxidase labels in ligand binder assays. A wide range of enzyme immunoassays is already commercially available using this technology with semi-automated instrumentation.

Each Chapter is well referenced with a total of over 1400 references. The text concludes with an adequate subject index.

Anyone already using or contemplating the use of luminescence in chemical and biochemical analysis will find this text an invaluable up to date reference. It is a well constructed and produced readable text containing a great wealth of useful information.

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