

Book Review

Spectroscopy of Pharmaceutical Solids. Harry G. Brittain, Editor, Taylor & Francis, New York, NY, 2006, Hardcover, 592 pages, ISBN: 1574448935

Spectroscopy of pharmaceutical solids is a critical part of modern drug development and is widely used for various analyses of compounds and their interactions. This volume addressed many of the spectroscopic methods commonly employed during drug development with an emphasis on both theoretical foundations and examples of the applications of each method.

Beginning with an introduction on the nature and properties of electromagnetic radiation, the opening chapter presents a brief history of the development of the physical theories that collectively form our present understanding of light. From the failings of classical physics, continuing through the emergence of the quantum mechanical postulates describing the interaction of photons and electrons essential to accurately account for experimental observation, and concluding with an overview of the subatomic energy transitions on which the field of spectroscopic analysis is based, the first chapter provides a solid foundation from which the subsequent chapters will be constructed.

Chapters 2 and 3 discuss the spectroscopic techniques aimed at the core, or inner-shell, electrons of a molecule's constituent atoms. The chapters in this volume include an introductory section on the underlying physics and pertinent experimental design. Chapter 2 focuses on x-ray absorption spectroscopy (XAS) and concludes with numerous examples of XAS in the structural analysis of inorganic compounds and metallo-proteins, while Chapter 3 addresses x-ray photoelectron and x-ray fluorescence spectroscopy. Chapters 4–6 address valence-electron spectroscopic methods. Chapter 7 reviews the vibrational modes available to atoms within a molecule and how the transitions between these energy levels can be used to analyze molecular structure. Chapter 8 introduces the reader to IR spectroscopy, with an overview of the subject in terms of the principles, the instrumentation, and different methods available. The latter part of the chapter discusses the uses of IR spectroscopy in pharmaceutical applications making comparisons to other methods in terms of advantages and disadvantages. Raman, near-infrared, and NMR spectroscopy are covered in subsequent chapters.

One of the most pleasing aspects of this text is that the majority of the formulas are not presented merely as postulates, as in other literature addressing this field. In contrast, the most important formulas are preceded by derivations generally performed in multiple steps, with sufficient detail provided so as to make the underlying principles accessible even to those readers absent a strong background in physical chemistry.

It is not the premise of this volume to provide an exhaustive account of every facet associated with a given spectroscopic method, as indeed entire volumes have been composed on the topics of each chapter. Rather, this book was written for researchers in the pharmaceutical sciences who wish to obtain a more detailed understanding of the spectroscopic techniques that have become so integral to their field, and as such, has accomplished its goal. For those readers who wish to delve deeper into a given topic, the authors have provided numerous references that will facilitate this undertaking. The transition between theory, comprised of the physical and chemical discussions opening each chapter, and practice, as provided by numerous examples presented throughout the text is understandably difficult at times. Detailed examples that translate theory to the output of a given spectroscopy instrument would be an excellent augmentation to subsequent editions. Newer techniques such as terahertz spectroscopy may also be a nice addition to the text.

In summary, the scope of the material covered in this text is truly extensive, and at times may prove overwhelming to the casual reader. However, it is this level of detail that allows this book to serve as an excellent reference for anyone desiring an in-depth understanding of the chemical and physical principles underlying various spectroscopic techniques ubiquitous in the pharmaceutical sciences.

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