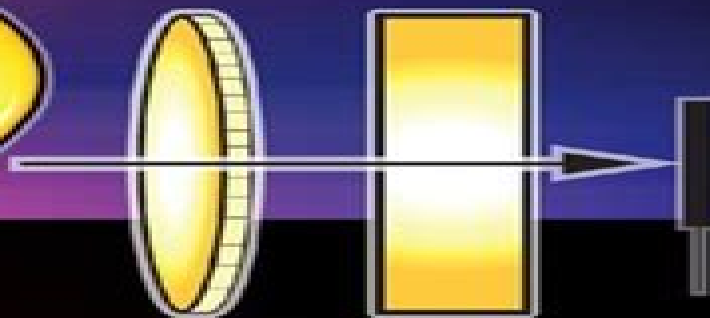




SECOND EDITION

# Pharmaceutical and Medical Applications of Near-Infrared Spectroscopy



Emil W. Ciurczak • Benoît Igne



CRC Press  
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# Near Infrared Spectroscopy In Pharmaceutical And Medical Applications

**Yukihiro Ozaki, Malgorzata  
Baranska, Igor K. Lednev, Bayden R.  
Wood**



## **Near Infrared Spectroscopy In Pharmaceutical And Medical Applications:**

*Pharmaceutical and Medical Applications of Near-Infrared Spectroscopy* Emil W. Ciurczak, James K. Drennen III, 2002-02-08 This book discusses the theory instrumentation validation and implementation of near infrared spectroscopy for pharmaceutical and medical applications It showcases a diverse range of contemporary methods for the production screening and analysis of new drug products and pharmaceuticals Presents current approaches in near infrared spectroscopy

**Pharmaceutical and Medical Applications of Near-Infrared Spectroscopy, Second Edition** Emil W. Ciurczak, Benoit Igne, 2014-12-15 Since the completion of the first edition of this book major developments have occurred in the pharmaceutical industry that have shaped the field of near infrared NIR spectroscopy A new initiative from the U S Food and Drug Administration FDA to modernize regulations of pharmaceutical manufacturing and drug quality has helped position NIR spectroscopy as an effective tool for pharmaceutical testing *Pharmaceutical and Medical Applications of Near Infrared Spectroscopy Second Edition* reflects these developments and brings readers an up to date summary of how this technique is being applied to pharmaceutical manufacturing Topics include The origins and principles of NIR spectroscopy including early instrumentation spectroscopic theory and light particle interaction The physics of each instrument type the strengths and weaknesses of each and the manufacturers that produce them The possible advantages of using NIR methods for monitoring or controlling blending as well as practical concerns for mixing processes NIR spectroscopy as applied to traditional granulation drug layering and film coating of beads or granules Pharmaceutical assays including qualitative analysis quantitative analysis determination of actives in tablets and capsules and considerations for intact dosage form analysis Steps involved in the validation and acceptance of an NIR spectroscopy method including quality assurance qualification and verification of instruments and the International Conference on Harmonization ICH guidelines Medical applications including those related to blood glucose measurements tissue and major organ analysis fetal analysis and cancer research Providing comprehensive coverage of NIR spectroscopy from theory mathematics application and mechanics of NIR analysis the book supplies ample references to facilitate further research into this burgeoning field *Pharmaceutical and Medical Applications of Near-infrared Spectroscopy*, 2010 **Pharmaceutical and Medical Applications of Near-infrared Spectroscopy**, 2010 This book discusses the theory instrumentation validation and implementation of near infrared spectroscopy for pharmaceutical and medical applications It showcases a diverse range of contemporary methods for the production screening and analysis of new drug products and pharmaceuticals Presents current approaches in near infrared spectroscopy NIR to monitor and control multiple phases of the drug manufacturing process Blend uniformity analysis Mixing Discussion of reported work Sampling and data handling Segregation Demixing and Particle Size Granulation Drying and Coating Monitoring Granulation and Drying Coating and Pelletization Pharmaceutical assays Qualitative analysis Quantitative analysis Determination of actives in tablets and capsules Considerations for intact dosage form analysis

Validation issues International conference on harmonization Historical perspective Medical applications Blood glucose Blood oxygenation Tissue Major organs Blood chemistry Fetuses and newborns Cancer and precancer Photon migration in tissues Review articles Index      **Encyclopedia of Pharmaceutical Technology** James Swarbrick, 2013-07-01 Presenting

authoritative and engaging articles on all aspects of drug development dosage manufacturing and regulation this Third Edition enables the pharmaceutical specialist and novice alike to keep abreast of developments in this rapidly evolving and highly competitive field A dependable reference tool and constant companion for years to come      *Vibrational Spectroscopy in Protein Research* Yukihiro Ozaki, Malgorzata Baranska, Igor K. Lednev, Bayden R. Wood, 2020-05-19 Vibrational Spectroscopy in Protein Research offers a thorough discussion of vibrational spectroscopy in protein research providing researchers with clear practical guidance on methods employed areas of application and modes of analysis With chapter contributions from international leaders in the field the book addresses basic principles of vibrational spectroscopy in protein research instrumentation and technologies available sampling methods quantitative analysis origin of group frequencies and qualitative interpretation In addition to discussing vibrational spectroscopy for the analysis of purified proteins chapter authors also examine its use in studying complex protein systems including protein aggregates fibrous proteins membrane proteins and protein assemblies Emphasis throughout the book is placed on applications in human tissue cell development and disease analysis with chapters dedicated to studies of molecular changes that occur during disease progression as well as identifying changes in tissues and cells in disease studies Provides thorough guidance in implementing cutting edge vibrational spectroscopic methods from international leaders in the field Emphasizes in vivo in situ and non invasive analysis of proteins in biomedical and life science research more broadly Contains chapters that address vibrational spectroscopy for the study of simple purified proteins and protein aggregates fibrous proteins membrane proteins and protein assemblies

*Handbook of Near-Infrared Analysis* Emil W. Ciurczak, Benoît Igne, Jerome Workman, Jr., Donald A. Burns, 2021-05-19 Rapid inexpensive and easy to deploy near infrared NIR spectroscopy can be used to analyze samples of virtually any composition origin and condition The Handbook of Near Infrared Analysis Fourth Edition explores the factors necessary to perform accurate and time and cost effective analyses across a growing spectrum of disciplines This updated and expanded edition incorporates the latest advances in instrumentation computerization chemometrics applied to NIR spectroscopy and method development in NIR spectroscopy and underscores current trends in sample preparation calibration transfer process control data analysis instrument performance testing and commercial NIR instrumentation This work offers readers an unparalleled combination of theoretical foundations cutting edge applications and practical experience Additional features include the following Explains how to perform accurate as well as time and cost effective analyses Reviews software enabled chemometric methods and other trends in data analysis Highlights novel applications in pharmaceuticals polymers plastics petrochemicals textiles foods and beverages baked products agricultural products biomedicine nutraceuticals and counterfeit

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*Portable Spectroscopy and Spectrometry, Applications* Richard A. Crocombe, Pauline E. Leary, Brooke W. Kammrath, 2021-03-29 The most comprehensive resource available on the many applications of portable spectrometers including material not found in any other published work Portable Spectroscopy and Spectrometry Volume Two is an authoritative and up to date compendium of the diverse applications for portable spectrometers across numerous disciplines Whereas Volume One focuses on the specific technologies of the portable spectrometers themselves Volume Two explores the use of portable instruments in wide range of fields including pharmaceutical development clinical research food analysis forensic science geology astrobiology cultural heritage and archaeology Volume Two features contributions by a multidisciplinary team of experts with hands on experience using portable instruments in their respective areas of expertise Organized both by instrumentation type and by scientific or technical discipline 21 detailed chapters cover various applications of portable ion mobility spectrometry IMS infrared and near infrared NIR spectroscopy Raman and x ray fluorescence XRF spectroscopy smartphone spectroscopy and many others Filling a significant gap in literature on the subject the second volume of Portable Spectroscopy and Spectrometry Features a significant amount of content published for the first time or not available in existing literature Brings together work by authors with assorted backgrounds and fields of study Discusses the central role of applications in portable instrument development Covers the algorithms calibrations and libraries that are of critical importance to successful applications of portable instruments Includes chapters on portable spectroscopy applications in areas such as the military agriculture and feed hazardous materials HazMat art conservation and environmental science Portable Spectroscopy and Spectrometry Volume Two is an indispensable resource for developers of portable instruments in universities research institutes instrument companies civilian and government purchasers trainers operators of portable instruments and educators and students in portable spectroscopy courses

*Encyclopedia of Spectroscopy and Spectrometry*, 2016-09-22 This third edition of the Encyclopedia of Spectroscopy and Spectrometry Three Volume Set provides authoritative and comprehensive coverage of all aspects of spectroscopy and closely related subjects that use the same fundamental principles including mass spectrometry imaging techniques and applications It includes the history theoretical background details of instrumentation and technology and current applications of the key areas of spectroscopy The new edition will include over 80 new articles across the field These will complement those from the previous edition which have been brought up to date to reflect the latest trends in the field Coverage in the third edition includes Atomic spectroscopy Electronic spectroscopy Fundamentals in spectroscopy High Energy spectroscopy Magnetic

resonance Mass spectrometry Spatially resolved spectroscopic analysis Vibrational rotational and Raman spectroscopies The new edition is aimed at professional scientists seeking to familiarize themselves with particular topics quickly and easily This major reference work continues to be clear and accessible and focus on the fundamental principles techniques and applications of spectroscopy and spectrometry Incorporates more than 150 color figures 5 000 references and 300 articles for a thorough examination of the field Highlights new research and promotes innovation in applied areas ranging from food science and forensics to biomedicine and health Presents a one stop resource for quick access to answers and an in depth examination of topics in the spectroscopy and spectrometry arenas

*Concise Handbook Of Analytical Spectroscopy, The: Theory, Applications, And Reference Materials (In 5 Volumes)* Jerome (Jerry) James Workman, Jr, 2016-06-17 The concept of improving the use of electromagnetic energy to achieve a variety of qualitative and quantitative spectroscopic measurements on solid and liquid materials has been proliferating at a rapid rate The use of such technologies to measure chemical composition appearance for classification and to achieve detailed understanding of material interactions has prompted a dramatic expansion in the use and development of spectroscopic techniques over a variety of academic and commercial fields The Concise Handbook of Analytical Spectroscopy is integrated into 5 volumes each covering the theory instrumentation sampling methods experimental design and data analysis techniques as well as essential reference tables figures and spectra for each spectroscopic region The detailed practical aspects of applying spectroscopic tools for many of the most exciting and current applications are covered Featured applications include medical biomedical optical physics common commercial analysis methods spectroscopic quantitative and qualitative techniques and advanced methods This multi volume handbook is designed specifically as a reference tool for students commercial development and quality scientists and researchers or technologists in a variety of measurement endeavours Number of Illustrations and Tables 393 b w illus 304 colour illus 413 tables Related Link s [Handbook of Modern Pharmaceutical Analysis](#) Satinder Ahuja, Stephen Scypinski, 2010-11-11 Handbook of Modern Pharmaceutical Analysis Second Edition synthesizes the complex research and recent changes in the field while covering the techniques and technology required for today s laboratories The work integrates strategy case studies methodologies and implications of new regulatory structures providing complete coverage of quality assurance from the point of discovery to the point of use Treats pharmaceutical analysis PA as an integral partner to the drug development process rather than as a service to it Covers method development validation selection testing modeling and simulation studies combined with advanced exploration of assays impurity testing biomolecules and chiral separations Features detailed coverage of QA ethics and regulatory guidance quality by design good manufacturing practice as well as high tech methodologies and technologies from lab on a chip to LC MS LC NMR and LC NMR MS

**Polymorphism in Pharmaceutical Solids** Harry G. Brittain, 2018-11-12 Using clear and practical examples Polymorphism of Pharmaceutical Solids Second Edition presents a comprehensive examination of polymorphic behavior in pharmaceutical development that is

ideal for pharmaceutical development scientists and graduate students in pharmaceutical science This edition focuses on pharmaceutical aspects of polymorphism a      **Measuring Elemental Impurities in Pharmaceuticals** Robert Thomas,2018-01-29 Recent regulations on heavy metal testing have required the pharmaceutical industry to monitor a suite of elemental impurities in pharmaceutical raw materials drug products and dietary supplements These new directives s are described in the new United States Pharmacopeia USP Chapters and together with Q3D Step 4 guidelines for elemental impurities drafted by the ICH International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use a consortium of global pharmaceutical associations including the European Pharmacopeia Ph Eur the Japanese Pharmacopeia JP and the USP This book provides a complete guide to the analytical methodology instrumental techniques and sample preparation procedures used for measuring elemental impurities in pharmaceutical and nutraceutical materials It offers readers the tools to better understand plasma spectrochemistry to optimize detection capability for the full suite of elemental PDE Permitted Daily Exposure levels in the various drug delivery categories Other relevant information covered in the book includes The complete guide to measuring elemental impurities in pharmaceutical and nutraceutical materials Covers heavy metals testing in the pharmaceutical industry from an historical perspective Gives an overview of current USP Chapters and and ICH Q3D Step 4 Guidelines Explains the purpose of validation protocols used in Chapter including how J values are calculated Describes fundamental principles and practical capabilities of ICP MS and ICP OES Offers guidelines about the optimum strategy for risk assessment Provides tips on how best to prepare and present your data for regulatory inspection An indispensable resource the fundamental principles and practical benefits of ICP OES and ICP MS are covered in a reader friendly format that a novice who is carrying out elemental impurities testing in the pharmaceutical and nutraceutical communities will find easy to understand      *Biochemistry and Molecular Biology Compendium* Roger L. Lundblad,2019-11-11 This book is an accessible resource offering practical information not found in more database oriented resources The first chapter lists acronyms with definitions and a glossary of terms and subjects used in biochemistry molecular biology biotechnology proteomics genomics and systems biology There follows chapters on chemicals employed in biochemistry and molecular biology complete with properties and structure drawings Researchers will find this book to be a valuable tool that will save them time as well as provide essential links to the roots of their science Key selling features Contains an extensive list of commonly used acronyms with definitions Offers a highly readable glossary for systems and techniques Provides comprehensive information for the validation of biotechnology assays and manufacturing processes Includes a list of Log P values water solubility and molecular weight for selected chemicals Gives a detailed listing of protease inhibitors and cocktails as well as a list of buffers      Spectroscopy Mark F. Vitha,2018-10-30 Provides students and practitioners with a comprehensive understanding of the theory of spectroscopy and the design and use of spectrophotometers In this book you will learn the fundamental principles underpinning molecular spectroscopy and the

connections between those principles and the design of spectrophotometers Spectroscopy along with chromatography mass spectrometry and electrochemistry is an important and widely used analytical technique Applications of spectroscopy include air quality monitoring compound identification and the analysis of paintings and culturally important artifacts This book introduces students to the fundamentals of molecular spectroscopy including UV visible infrared fluorescence and Raman spectroscopy in an approachable and comprehensive way It goes beyond the basics of the subject and provides a detailed look at the interplay between theory and practice making it ideal for courses in quantitative analysis instrumental analysis and biochemistry as well as courses focused solely on spectroscopy It is also a valuable resource for practitioners working in laboratories who regularly perform spectroscopic analyses Spectroscopy Principles and Instrumentation Provides extensive coverage of principles instrumentation and applications of molecular spectroscopy Facilitates a modular approach to teaching and learning about chemical instrumentation Helps students visualize the effects that electromagnetic radiation in different regions of the spectrum has on matter Connects the fundamental theory of the effects of electromagnetic radiation on matter to the design and use of spectrophotometers Features numerous figures and diagrams to facilitate learning Includes several worked examples and companion exercises throughout each chapter so that readers can check their understanding Offers numerous problems at the end of each chapter to allow readers to apply what they have learned Includes case studies that illustrate how spectroscopy is used in practice including analyzing works of art studying the kinetics of enzymatic reactions detecting explosives and determining the DNA sequence of the human genome Complements Chromatography Principles and Instrumentation The book is divided into five chapters that cover the Fundamentals of Spectroscopy UV visible Spectroscopy Fluorescence Luminescence Spectroscopy Infrared Spectroscopy and Raman Spectroscopy Each chapter details the theory upon which the specific techniques are based provides ways for readers to visualize the molecular level effects of electromagnetic radiation on matter describes the design and components of spectrophotometers discusses applications of each type of spectroscopy and includes case studies that illustrate specific applications of spectroscopy Each chapter is divided into multiple sections using headings and subheadings making it easy for readers to work through the book and to find specific information relevant to their interests Numerous figures exercises worked examples and end of chapter problems reinforce important concepts and facilitate learning Spectroscopy Principles and Instrumentation is an excellent text that prepares undergraduate students and practitioners to operate in modern laboratories

Introduction to Experimental Infrared Spectroscopy Mitsuo Tasumi, 2014-09-15 Infrared spectroscopy is generally understood to mean the science of spectra relating to infrared radiation namely electromagnetic waves in the wavelength region occurring intermediately between visible light and microwaves Measurements of infrared spectra have been providing useful information for a variety of scientific research and industrial studies for over half a century this is set to continue in the foreseeable future Introduction to Experimental Infrared Spectroscopy is intended to be a handy guide for

those who have no or limited experience in infrared spectroscopic measurements but are utilising infrared related methods for their research or in practical applications Written by leading researchers and experienced practitioners this work consists of 22 chapters and presents the basic theory methodology and practical measurement methods including ATR photoacoustic IR imaging NIR 2D COS and VCD The six Appendices will aid readers in understanding the concepts presented in the main text Written in an easy to understand way this book is suitable for students researchers and technicians working with infrared spectroscopy and related methods      Spectrochemical Analysis Using Infrared Multichannel Detectors Rohit Bhargava,Ira W. Levin,2008-04-15 This book provides a state of the art review of a major recent technology which has now reached a level of maturity The editors have pioneered the development and application of these techniques and technologies and the chapter authors are leading practitioners in their subject areas The volume encompasses methods and instrumentation across a range of applications It is directed at researchers and professionals in vibrational spectroscopy analytical chemistry materials science biomedicine food science and combinatorial chemistry      Design of Experiments for Chemical, Pharmaceutical, Food, and Industrial Applications Carrillo-Cedillo, Eugenia Gabriela,Rodríguez-Avila, José Antonio,Arredondo-Soto, Karina Cecilia,Cornejo-Bravo, José Manuel,2019-12-13 Statistics is a key characteristic that assists a wide variety of professions including business government and factual sciences Companies need data calculation to make informed decisions that help maintain their relevance Design of experiments DOE is a set of active techniques that provides a more efficient approach for industries to test their processes and form effective conclusions Experimental design can be implemented into multiple professions and it is a necessity to promote applicable research on this up and coming method Design of Experiments for Chemical Pharmaceutical Food and Industrial Applications is a pivotal reference source that seeks to increase the use of design of experiments to optimize and improve analytical methods and productive processes in order to use less resources and time While highlighting topics such as multivariate methods factorial experiments and pharmaceutical research this publication is ideally designed for industrial designers research scientists chemical engineers managers academicians and students seeking current research on advanced and multivariate statistics      **Optical Sensor Systems in Biotechnology** Govind Rao,2009-11-03 Of all things natural light is the most sublime From the very existential belief of the origins of the universe to its role in the evolution of life on earth light has been inextricably woven into every aspect of our lives I am grateful to Springer Verlag and Thomas Scheper for this invitation to organize this volume that continues to expand the use of light to create next generation sensing applications Indeed the very act of expanding the frontiers of learning and knowledge are referred to in many languages and cultures as enlightenment Early optical instruments relied largely on simple combinations of mirrors prisms and lenses With these simple devices substantial progress was made in our understanding of the properties of light and of its interactions with matter Things got more complicated with the evolution of optical instruments in laboratory use Early systems used bulky and expensive hardware to generate light split it into the

desired wavelengths and finally collect it for analysis The discovery of the laser pushed the technology further but did not do much to make its adoption more widespread as the lasers themselves were large and required substantial electrical power to operate The true revolution is just beginning Advances in microelectronics have resulted in the possibility of truly low cost using the consumer electronics industry as a parallel devices that exploit optical measurement technology

**Spectroscopic and Chemometric Techniques for Pharmaceutical Applications** Gerard G. Dumancas, Lakshmi Viswanath, Arnold Lubguban, Beulah Solivio, Roberto M. Malaluan, Michael Waller, 2023-05-15 Spectroscopic and chemometric methods have become routinely applied tools in pharmaceutical industries because they reduce the analysis time and minimize the use of chemicals The contents of this digital primer are to help newcomers in the field by providing basic content information about various spectroscopic and chemometric tools used in pharmaceutical analysis

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