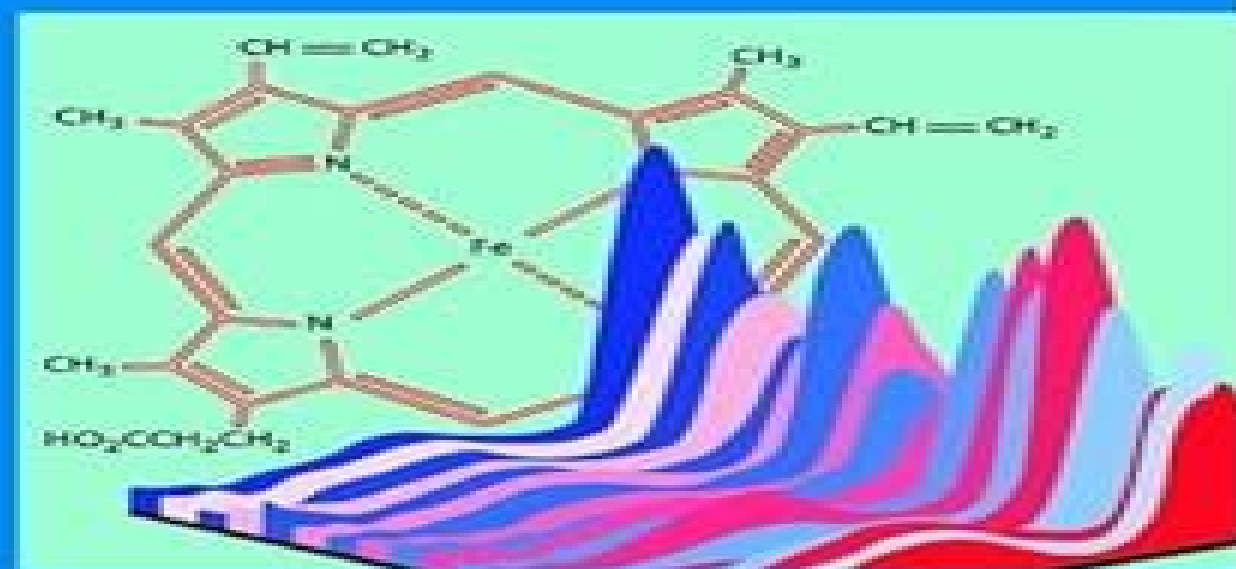


# Near-Infrared Spectroscopy

Principles, Instruments, Applications

Edited by

H. W. Siesler, Y. Ozaki, S. Kawata, H. M. Heise



# Near Infrared Spectroscopy Principles Instruments Applications

**Hoang Vu Dang, Federico Marini**



## **Near Infrared Spectroscopy Principles Instruments Applications:**

Near-Infrared Spectroscopy Heinz W. Siesler, Yukihiro Ozaki, Satoshi Kawata, H. Michael Heise, 2008-07-11 Over the last few years near infrared NIR spectroscopy has rapidly developed into an important and extremely useful method of analysis. In fact, for certain research areas and applications ranging from material science via chemistry to life sciences, it has become an indispensable tool because this fast and cost-effective type of spectroscopy provides qualitative and quantitative information not available from any other technique. This book offers a balanced overview of the fundamental theory and instrumentation of NIR spectroscopy, introducing the material in a readily comprehensible manner. A considerable part of the text is dedicated to practical applications, including sample preparation and investigations of polymers, textiles, drugs, food, and animal feed. However, special topics such as two-dimensional correlation analysis are also covered in separate chapters. Written by eight experts in different fields, this book presents an introduction to the current state of developments and is valuable to

spectroscopists and to practitioners applying NIR spectroscopy as a daily analytical tool. **Near-infrared Spectroscopy**

Heinz W. Siesler, 2009 **Near-Infrared Spectroscopy** Yukihiro Ozaki, Christian Huck, Satoru Tsuchikawa, Søren Balling Engelsen, 2020-11-13 This book provides knowledge of the basic theory, spectral analysis methods, chemometrics, instrumentation, and applications of near infrared NIR spectroscopy, not as a handbook but rather as a sourcebook of NIR spectroscopy. Thus, some emphasis is placed on the description of basic knowledge that is important in learning and using NIR spectroscopy. The book also deals with applications for a variety of research fields that are very useful for a wide range of readers, from graduate students to scientists and engineers in both academia and industry. For readers who are novices in NIR spectroscopy, this book provides a good introduction, and for those who already are familiar with the field, it affords an excellent means of strengthening their knowledge about NIR spectroscopy and keeping abreast of recent developments.

*Guidebook on Spectroscopic Techniques for Undergraduate Students* Bhawna Pareek, Leena Jaswal, 2024-01-26 Unlock the Power of Spectroscopy for Analysis. Spectroscopy provides critical insights into chemical structures and properties. This book offers an in-depth guide to four essential spectroscopy techniques for every chemist's toolkit: UV-Vis, IR, Mass, and NMR. Learn the theoretical foundations that make spectroscopy possible. Master the instrumentation involved in modern spectroscopic analysis. Discover practical applications from molecular identification to structural elucidation. Whether you are new to spectroscopy or looking to deepen your expertise, this book has you covered. **Key Features:** Comprehensive overview of UV-Vis, IR, Mass, and NMR spectroscopic techniques. Plain explanations of fundamental principles behind spectroscopy. Detailed guidance on instrumentation, equipment, and procedures. Practical examples demonstrating spectroscopic analysis in chemical research. Extensive illustrations and spectra to enhance understanding. Chapter summaries and practice questions for testing knowledge. Written by leading experts in analytical chemistry, this book combines deep scientific rigor with accessibility and relevance. It empowers chemistry students and working professionals to advance their skills and careers.

through a fuller command of essential spectroscopy techniques      *Instrument and Automation Engineers' Handbook* Bela G. Liptak, Kriszta Venczel, 2022-08-31 The Instrument and Automation Engineers Handbook IAEH is the Number 1 process automation handbook in the world The two volumes in this greatly expanded Fifth Edition deal with measurement devices and analyzers Volume one Measurement and Safety covers safety sensors and the detectors of physical properties while volume two Analysis and Analysis describes the measurement of such analytical properties as composition Complete with 245 alphabetized chapters and a thorough index for quick access to specific information the IAEH Fifth Edition is a must have reference for instrument and automation engineers working in the chemical oil gas pharmaceutical pollution energy plastics paper wastewater food etc industries      **Advances in Near Infrared Spectroscopy and Related Computational**

**Methods** Christian Huck, Krzysztof B. Bec, 2020-01-03 In the last few decades near infrared NIR spectroscopy has distinguished itself as one of the most rapidly advancing spectroscopic techniques Mainly known as an analytical tool useful for sample characterization and content quantification NIR spectroscopy is essential in various other fields e g NIR imaging techniques in biophotonics medical applications or used for characterization of food products Its contribution in basic science and physical chemistry should be noted as well e g in exploration of the nature of molecular vibrations or intermolecular interactions One of the current development trends involves the miniaturization and simplification of instrumentation creating prospects for the spread of NIR spectrometers at a consumer level in the form of smartphone attachments a breakthrough not yet accomplished by any other analytical technique A growing diversity in the related methods and applications has led to a dispersion of these contributions among disparate scientific communities The aim of this Special Issue was to bring together the communities that may perceive NIR spectroscopy from different perspectives It resulted in 30 contributions presenting the latest advances in the methodologies essential in near infrared spectroscopy in a variety of applications      **Proceedings of the 21st International Conference on Near Infrared Spectroscopy** Krzysztof

Bec, Christian Huck, 2025-05-01 The proceedings of 21st International Conference on Near Infrared Spectroscopy NIR 2023 Innsbruck presents a comprehensive collection of contributions of renowned researchers scientists and industry professionals who have converged to share their expertise and advancements at the NIR 2023 conference Covering a wide range of topics this volume reflects the outstanding versatility and practical importance of the potent analytical technique and its contemporary avenues The proceedings summarize the groundbreaking research novel instrumentation and diverse applications in the field of NIR spectroscopy The book explores the latest methods techniques and emerging trends in NIR spectroscopy that were presented and discussed at NIR 2023 It explores the underlying fundamental science development of innovative instrumentation methods as well as cutting edge data analysis techniques and their applications in key fields such as pharmaceuticals food analysis agriculture biomedical diagnostics and environmental monitoring Each article within this volume represents current trends in the field of NIR spectroscopy presenting original research and practical insights

Reflecting the topics of the premier NIR spectroscopy conference this book forms an indispensable resource for researchers practitioners and students seeking to stay at the forefront of NIR spectroscopy The hope is that the Proceedings of NIR 2023 will serve as a catalyst for further exploration collaboration and innovation in the dynamic realm of NIR spectroscopy

Chemometrics-based Spectroscopy for Pharmaceutical and Biomedical Analysis Hoang Vu Dang, Federico Marini, 2019-04-17 Chemometrics is the application of mathematics and statistics to chemical data in order to design or select optimal experimental procedures to provide maximum relevant information and to obtain knowledge about systems under study This chemical discipline has constantly developed to become a mature field of Analytical Chemistry after its inception in the 1970s The utility and versatility of chemometric techniques enable spectroscopists to perform multidimensional classification and or calibration of spectral data that make identification and quantification of analytes in complex mixtures possible Wavelets are mathematical functions that cut up data into different frequency components and then study each component with a resolution matched to its scale They are now being adapted for a vast number of signal processing due to their unprecedented success in terms of asymptotic optimality spatial adaptivity and computational efficiency In analytical chemistry they have increasingly shown great applicability and have been preferred over existing signal processing algorithms in noise removal resolution enhancement data compression and chemometrics modeling in chemical studies The aim of this Research Topic is to present state of the art applications of chemometrics in the field of spectroscopy with special attention to the use of wavelet transform Both reviews and original research articles on pharmaceutical and biomedical analysis are welcome in the specialty section Analytical Chemistry

**Near-Infrared Spectroscopy in Food Science and Technology** Yukihiro Ozaki, W. Fred McClure, Alfred A. Christy, 2006-10-25 This reference gives food science professionals a working understanding of near infrared spectroscopy NIRS and its role in maximizing food potential It explains the technical aspects of NIRS including basic principles characteristics of the NIR spectra instrumentation sampling techniques and chemometrics The book details applications of NIRS in agricultural and marine products foodstuffs and processed foods engineering and process monitoring and food safety and disease diagnosis

**Near-Infrared Spectroscopy** H. W. Siesler, 2002-02-15 Over the last few years near infrared NIR spectroscopy has rapidly developed into an important and extremely useful method of analysis In fact for certain research areas and applications ranging from material science via chemistry to life sciences it has become an indispensable tool because this fast and cost effective type of spectroscopy provides qualitative and quantitative information not available from any other technique This book offers a balanced overview of the fundamental theory and instrumentation of NIR spectroscopy introducing the material in a readily comprehensible manner A considerable part of the text is dedicated to practical applications including sample preparation and investigations of polymers textiles drugs food and animal feed However special topics such as two dimensional correlation analysis are also covered in separate chapters Written by eight experts in

different fields this book presents an introduction to the current state of developments and is valuable to spectroscopists and to practitioners applying NIR spectroscopy as a daily analytical tool **Animal Health and Sustainability** Tünay Konaş AŞKAR,Şinasi AŞKAR,2025-12-25 *Spectroscopic Methods in Food Analysis* Adriana S. Franca,Leo M.L. Nollet,2017-12-14

Given the inherent complexity of food products most instrumental techniques employed for quality and authenticity evaluation e g chromatographic methods are time demanding expensive and involve a considerable amount of manual labor Therefore there has been an increasing interest in simpler faster and reliable analytical methods for assessing food quality attributes *Spectroscopic Methods in Food Analysis* presents the basic concepts of spectroscopic methods together with a discussion on the most important applications in food analysis The determination of product quality and authenticity and the detection of adulteration are major issues in the food industry causing concern among consumers and special attention among food manufacturers As such this book explains why spectroscopic methods have been extensively employed to the analysis of food products as they often require minimal or no sample preparation provide rapid and on line analysis and have the potential to run multiple tests on a single sample i e non destructive This book consists of concepts related to food quality and authenticity that are quite broad given the different demands of the manufacturer the consumer the surveillance and the legislative bodies that ultimately provide healthy and safe products

**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      **Polymorphism in Pharmaceutical Solids, Second Edition** H. G. Brittain, 2009-07-27 Using clear and practical examples this volume presents a comprehensive examination of polymorphic behavior in pharmaceutical development The book is ideal for pharmaceutical development scientists and graduate students in pharmaceutical science This second edition focuses on the pharmaceutical aspects of polymorphism and solvatomorphism while systematically explaining their thermodynamic and structural origins Topics in this edition include computational methodologies high throughput screening methods pharmaceutical cocrystals and thermally induced and solution mediated phase transformations The book also examines amorphous solids the amorphous state and crystallography preparation and characterization      **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      Applied Spectroscopy, 2008      **Biomedical Vibrational Spectroscopy** Peter Lasch, Janina Kneipp, 2008-04-04 This reference provides a comprehensive overview of experimental and data analysis methodologies in vibrational spectroscopy and their biomedical applications It focuses on the aspects of spectroscopic methods that are most relevant to biomedical applications INDICE 1 Vibrational Spectroscopy in Microbiology and Medical Diagnostics Dieter Naumann 2 Biomedical Vibrational Spectroscopy Technical Advances Etc      **Chemical Analysis** David D. Cunningham, Julie A. Stenzen, 1941      **Angewandte Botanik**, 2002      **Handbook of Spectroscopy** Tuan Vo-Dinh, Günter Gauglitz, 2003

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