

Near Infrared Spectroscopy An Overview

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.

Introduction to EEG- and Speech-Based Emotion Recognition Methods examines the background, methods, and utility of using electroencephalograms (EEGs) to detect and recognize different emotions. By incorporating these methods in brain-computer interface (BCI), we can achieve more natural, efficient communication between humans and computers. This book discusses how emotional states can be recognized in EEG images, and how this is useful for BCI applications. EEG and speech processing methods are explored, as are the technological basics of how to operate and record EEGs. Finally, the authors include information on EEG-based emotion recognition, classification, and a proposed EEG/speech fusion method for how to most accurately detect emotional states in EEG recordings. Provides detailed insight on the science of emotion and the brain signals underlying this phenomenon Examines emotions as a multimodal entity, utilizing a bimodal emotion recognition system of EEG and speech data Details the implementation of techniques used for acquiring as well as analyzing EEG and speech signals for emotion recognition

Basic theory, applications, and recent trends in analytical techniques used in crude oil and related products analysis This book covers the application of different spectroscopic methods to characterize crude oil and related products. Its topics are presented in a pedagogical manner so that those new to the subject can better understand the content. The book begins by familiarizing the reader with the rheological characterization of crude oil and related products. Subsequent chapters are directed towards the current trends of different spectroscopic methods for the characterization of crude oil. Analytical Characterization Methods for Crude Oil and Related Products features chapters on: optical interrogation of petroleum asphaltenes (myths and reality); ESR characterization of organic free radicals in petroleum products; high-field, pulsed, and double resonance studies of crude oils and their derivatives; NMR spectroscopy in bitumen characterization; applications of Raman spectroscopy in crude oil and bitumen characterization; and more. Uses a bottom-up approach—starting from the basic theory of the technique followed by its applications and recent trends in crude oil analysis Includes informative content so as to take a technician to the level of using a particular analytical method Covers relevany information so as to enable a manager in the industry to make purchasing decisions Analytical Characterization Methods for Crude Oil and Related Products is aimed at researchers in academia as well as technicians and developers of new analytical methods in the oil industry and related areas. It will also be of interest to professionals, scientists, and graduate students in analytical sciences dealing with oil and environmental analysis.

New Horizons in Neurovascular Coupling: A Bridge Between Brain Circulation and Neural Plasticity is the latest volume in the Progress in Brain Research series that focuses on new trends and developments in neurovascular coupling. This established international series examines major areas of basic and clinical research within the neurosciences, as well as popular and emerging subfields. This volume takes an integrated approach to review and summarize some of the most recent progress reported on the connection between brain circulation and neural plasticity. Explores new trends and developments in basic and clinical research in the neurovascular coupling subfield of neuroscience Uses an integrated approach to review and summarize recent progress Emphasizes potential applications in a clinical setting Enhances the literature of neuroscience by further expanding the established, ongoing international series Progress in Brain Research

Modern Techniques for Food Authentication, Second Edition presents a comprehensive review of the novel techniques available to authenticate food products, including various spectroscopic technologies, methods based on isotopic analysis and chromatography, and other techniques based on DNA, enzymatic analysis and electrophoresis. This new edition pinpoints research and development trends for those working in research, development and operations in the food industry, giving them readily accessible information on modern food authentication techniques to ensure a safe and authentic food supply. It will also serve as an essential reference source to undergraduate and postgraduate students, and for researchers in universities and research institutions. Presents emerging imaging techniques that have proven to be powerful, non-destructive tools for food authentication Includes applications of hyperspectral imaging to reflect the current trend of developments in food imaging technology for each topic area Provides pixel level visualization techniques needed for fast and effective food sample testing Contains two new chapters on Imaging Spectroscopic Techniques

This informative and state-of-the-art book on Infrared Spectroscopy is addressed to Researchers in Medicine as well as to Pharmaceutical Industry and Agriculture. It features 7 specialized chapters of MIRS and NIRS covering applications in proteins and biopolymers; food quality research and food safety applications; and medical applications, such as Down syndrome disorders of tooth, probing of brain oxygen, the role of CO₂ in blood pressure and diagnosis of metastatic cancer. This book highlights the span of modern Infrared applications.

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.

Language Disorders from Infancy Through Adolescence, 4th Edition is the go-to text for all the information you need to properly assess childhood language disorders and provide appropriate treatment. This core resource spans the entire developmental period through adolescence, and uses a descriptive-developmental approach to present basic concepts and vocabulary, an overview of key issues and controversies, the scope of communicative difficulties that make up child language disorders, and information on how language pathologists approach the assessment and intervention processes. This new edition also features significant updates in research, trends, instruction best practices, and social skills assessment. Comprehensive text covers the entire developmental period through adolescence. Clinical application focus featuring case studies, clinical vignettes, and suggested projects helps you apply concepts to professional practice. Straightforward, conversational writing style makes this book easy to read and understand. More than 230 tables and boxes summarize important information such as dialogue examples, sample assessment plans, assessment and intervention principles, activities, and sample transcripts. UNIQUE! Practice exercises with sample transcripts allow you to apply different methods of analysis. UNIQUE! Helpful study guides at the end of each chapter help you review and apply what you have learned. Versatile text is perfect for a variety of language disorder courses, and serves as a great reference tool for professional practitioners. Highly regarded lead author Rhea Paul lends her expertise in diagnosing and managing pediatric language disorders. Communication development milestones are printed on the inside front cover for quick access. Chapter objectives summarize what you can expect to learn in each chapter. Updated content features the latest research, theories, trends and techniques in the field. Information on autism incorporated throughout the text Best practices in preliteracy and literacy instruction The role of the speech-language pathologist on school literacy teams and in response to intervention New reference sources Student/Professional Resources on Evolve include an image bank, video clips, and references linked to PubMed.

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.

Fast, inexpensive, and easy-to-use, near-infrared (NIR) spectroscopy can be used to analyze small samples of virtually any composition. The *Handbook of Near Infrared Analysis, Third Edition* explains how to perform accurate as well as time- and cost-effective analyses across a growing spectrum of disciplines. Presenting nearly 50% new and revised material, this thoroughly updated edition incorporates the latest advances in instrumentation, computerization, calibration, and method development in NIR spectroscopy. The book underscores current trends in sample preparation, calibration transfer, process control, data analysis, and commercial NIR instrumentation. New chapters highlight novel applications including the analysis of agro-forestry products, polymers, blood, and control serum. They also cover NIR spectra, process analytical technologies (PAT), quantitative and qualitative analyses for nutraceuticals, NIR photography uses in medicine, and counterfeit detection methods for pharmaceuticals and currency. Offering the most complete single-source guide of its kind, the *Handbook of Near Infrared Analysis, Third Edition* continues to offer practicing chemists and spectroscopists an unparalleled combination of theoretical foundations, cutting-edge applications, and practical experience provided firsthand by more than 60 experts in the field.

Multivariate Calibration Harald Martens, Chemist, Norwegian Food Research Institute, Aas, Norway and Norwegian Computing Center, Oslo, Norway Tormod Næs, Statistician, Norwegian Food Research Institute, Aas, Norway The aim of this inter-disciplinary book is to present an up-to-date view of multivariate calibration of analytical instruments, for use in research,

development and routine laboratory and process operation. The book is intended to show practitioners in chemistry and technology how to extract the quantitative and understandable information embedded in non-selective, overwhelming and apparently useless measurements by multivariate data analysis. Multivariate calibration is the process of learning how to combine data from several channels, in order to overcome selectivity problems, gain new insight and allow automatic outlier detection. Multivariate calibration is the basis for the present success of high-speed Near-Infrared (NIR) diffuse spectroscopy of intact samples. But the technique is very general: it has shown similar advantages in, for instance, UV, Vis, and IR spectrophotometry, (transmittance, reflectance and fluorescence), for x-ray diffraction, NMR, MS, thermal analysis, chromatography (GC, HPLC) and for electrophoresis and image analysis (tomography, microscopy), as well as other techniques. The book is written at two levels: the main level is structured as a tutorial on the practical use of multivariate calibration techniques. It is intended for university courses and self-study for chemists and technologists, giving one complete and versatile approach, based mainly on data compression methodology in self-modelling PLS regression, with considerations of experimental design, data pre-processing and model validation. A second, more methodological, level is intended for statisticians and specialists in chemometrics. It compares several alternative calibration methods, validation approaches and ways to optimize the models. The book also outlines some cognitive changes needed in analytical chemistry, and suggests ways to overcome some communication problems between statistics and chemistry and technology.

This book presents a cross-section of the most recent developments in near infrared spectroscopy. Applications, spectroscopic theory, chemometrics and instrumentation are all covered. The variety of contributors is a striking reflection of the broad range of applications of this technique. Workers in agriculture, food science, medicine, life sciences, pharmaceuticals, textiles, general chemicals and polymers have all contributed the latest developments from their fields. The book is essential reading for workers in NIR spectroscopy and will greatly benefit those considering implementing NIR in their work.

This volume explores developments in techniques in diagnostics, DNA sequencing, bioanalysis of immunoassays, and single-molecule detection. It promotes the measurement, identification, monitoring, analysis, and application of near-infrared spectroscopy (NIR) to medical and pharmaceutical advances. The text also considers noninvasive methods of NIR for successful, cost-effective, and prompt diagnoses of diseases.

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.

This third edition of the Encyclopedia of Spectroscopy and Spectrometry 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

Provides an introduction to those needing to use infrared spectroscopy for the first time, explaining the fundamental aspects of this technique, how to obtain a spectrum and how to analyse infrared data covering a wide range of applications. Includes instrumental and sampling techniques Covers biological and industrial applications Includes suitable questions and problems in each chapter to assist in the analysis and interpretation of representative infrared spectra Part of the ANTS (Analytical Techniques in the Sciences) Series.

Written by an international panel of professional and academic peers, the book provides the engineer and technologist working in research, development and operations in the food industry with critical and readily accessible information on the art and science of infrared spectroscopy technology. The book should also serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions. Infrared (IR) Spectroscopy deals with the infrared part of the electromagnetic spectrum. It measure the absorption of different IR frequencies by a sample positioned in the path of an IR beam. Currently, infrared spectroscopy is one of the most common spectroscopic techniques used in the food industry. With the rapid development in infrared spectroscopic instrumentation software and hardware, the application of this technique has expanded into many areas of food research. It has become a powerful, fast, and non-destructive tool for food quality analysis and control. Infrared Spectroscopy for Food Quality Analysis and Control reflects this rapid technology development. The book is divided into two parts. Part I addresses principles and instruments, including theory, data treatment techniques, and infrared spectroscopy instruments. Part II covers the application of IRS in quality analysis and control for various foods including meat and meat products, fish and related products, and others. *Explores this rapidly developing, powerful and fast non-destructive tool for food quality analysis and control *Presented in two Parts -- Principles and Instruments, including theory, data treatment techniques, and instruments, and Application in Quality Analysis and Control for various foods making it valuable for understanding and application *Fills a need for a comprehensive resource on this area that includes coverage of NIR and MVA

Lubricants are essential in engineering, however more sustainable formulations are needed to avoid adverse effects on the ecosystem. Bio-based lubricant formulations present a promising solution. Biolubricants: Science and technology is a comprehensive, interdisciplinary and timely review of this important subject. Initial chapters address the principles

of lubrication, before systematically reviewing fossil and bio-based feedstock resources for biodegradable lubricants. Further chapters describe catalytic, (bio) chemical functionalisation processes for transformation of feedstocks into commercial products, product development, relevant legislation, life cycle assessment, major product groups and specific performance criteria in all major applications. Final chapters consider markets for biolubricants, issues to consider when selecting and using a lubricant, lubricant disposal and future trends. With its distinguished authors, *Biolubricants: Science and technology* is a comprehensive reference for an industrial audience of oil formulators and lubrication engineers, as well as researchers and academics with an interest in the subject. It provides an essential overview of scientific and technological developments enabling the cost-effective improvement of biolubricants, something that is crucial for the green future of the lubricant industry. A comprehensive, interdisciplinary and timely review of bio-based lubricant formulations

Addresses the principles of lubrication Reviews fossil and bio-based feedstock resources for biodegradable lubricants Over the past few decades, exciting developments have taken place in the field of near-infrared spectroscopy (NIRS). This has been enabled by the advent of robust Fourier transform interferometers and diode array solutions, coupled with complex chemometric methods that can easily be executed using modern microprocessors. The present edited volume intends to cover recent developments in NIRS and provide a broad perspective of some of the challenges that characterize the field. The volume comprises six chapters overall and covers several sectors. The target audience for this book includes engineers, practitioners, and researchers involved in NIRS system design and utilization in different applications. We believe that they will greatly benefit from the timely and accurate information provided in this work.

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.

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.

Updated and with approximately 25% new content, this textbook covers the latest developments, including instrumentation for microscopy and imaging, as well as current applications. The authors adopt a didactic approach, introducing infrared spectroscopy in a clear and well-structured way to provide students with a solid background in the principles and knowledge for efficiently using the method to obtain reliable results. Both beginners and experts will find up-to-date references for further reading. A must-have for advanced students (Master's and PhD) as well as those wanting to learn how the method works and how to work with it, including scientists from private and governmental labs. 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 detection. Underscores current trends in sample preparation, calibration transfer, process control, data analysis, and multiple aspects of

commercial NIR instrumentation. Offering the most complete single-source guide of its kind, the Handbook of Near Infrared Analysis, Fourth Edition, continues to offer practicing chemists and spectroscopists an unparalleled combination of theoretical foundations, cutting-edge applications, and detailed practical experience provided firsthand by more than 50 experts in the field.

Several developed countries are facing serious problems in medical environments owing to the aging society, and extension of healthy lifetime has become a big challenge. Biomedical engineering, in addition to life sciences and medicine, can help tackle these problems. Innovative technologies concerning minimally invasive treatment, prognosis and early diagnosis, point-of-care testing, regenerative medicine, and personalized medicine need to be developed to realize a healthy aging society. This book presents cutting-edge research in biomedical engineering from materials, devices, imaging, and information perspectives. The contributors are senior members of the Research Center for Biomedical Engineering, supported by the Ministry of Education, Culture, Sports, Science and Technology, Japan. All chapters are results of collaborative research in engineering and life sciences and cover nanotechnology, materials, optical sensing technology, imaging technology, image processing technology, and biomechanics, all of which are important areas in biomedical engineering. The book will be a useful resource for researchers, students, and readers who are interested in biomedical engineering.

The number of scientists and laboratories involved with brain mapping is increasing exponentially; and the second edition of this comprehensive reference has also grown much larger than the first (published in 1996), including, for example, five chapters on structural and functional MRI where the fi

This concise, user-oriented and up-to-date desk reference offers a broad introduction to the fascinating world of medical technology, fully considering today's progress and further development in all relevant fields. The Springer Handbook of Medical Technology is a systemized and well-structured guideline which distinguishes itself through simplification and condensation of complex facts. This book is an indispensable resource for professionals working directly or indirectly with medical systems and appliances every day. It is also meant for graduate and post graduate students in hospital management, medical engineering, and medical physics.

Designed to serve as the first point of reference on the subject, Comprehensive Chemometrics presents an integrated summary of the present state of chemical and biochemical data analysis and manipulation. The work covers all major areas ranging from statistics to data acquisition, analysis, and applications. This major reference work provides broad-ranging, validated summaries of the major topics in chemometrics—with chapter introductions and advanced reviews for each area. The level of material is appropriate for graduate students as well as active researchers seeking a ready reference on obtaining and analyzing scientific data. Features the contributions of leading experts from 21 countries, under the guidance of the Editors-in-Chief and a team of specialist Section Editors: L. Buydens; D. Coomans; P. Van Espen; A. De Juan; J.H. Kalivas; B.K. Lavine; R. Leardi; R. Phan-Tan-Luu; L.A. Sarabia; and J. Trygg Examines the merits and limitations of each technique through practical examples and extensive visuals: 368 tables and more than 1,300 illustrations (750 in full color) Integrates coverage of chemical and biological methods, allowing readers to consider and test a range of techniques Consists of 2,200 pages and more than 90 review articles, making it the most comprehensive work of its kind Offers print and online purchase options, the latter of which delivers flexibility, accessibility, and usability through the search tools and other productivity-enhancing features of ScienceDirect

Photobiomodulation in the Brain: Low-Level Laser (Light) Therapy in Neurology and Neuroscience presents the fundamentals of photobiomodulation and the diversity of applications in which light can be implemented in the brain. It will serve as a reference for future research in the area, providing the basic foundations readers need to understand photobiomodulation's science-based evidence, practical applications and related adaptations to specific therapeutic interventions. The book covers the mechanisms of action of photobiomodulation to the brain, and includes chapters describing the pre-clinical studies and clinical trials that have been undertaken for diverse brain disorders, including traumatic events, degenerative diseases and psychiatric disorders. Provides a much-needed reference on photobiomodulation with an unprecedented focus on the brain and its disorders Features a body of world-renowned editors and chapter authors that promote research, policy and funding Discusses the recent and rapid accumulation of literature in this area of research and the shift towards the use of non-invasive techniques in therapy

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

Interpretive spectroscopy provides a basis for the establishment of cause-and-effect relationships between NIR spectrometer response and the chemical properties of the samples. Without established cause-effect relationships, the measured data has no true predictive significance. This interpretive process is key for achieving an analytical

understanding of the measurement. In the expanded second edition of Practical Guide and Spectral Atlas for Interpretive Near-Infrared Spectroscopy, the authors include new research, editorials, supplements, and molecular structural formulas, along with updated references and information on NIR spectra. The thoroughly updated and revised second edition offers a full library of color spectra in a larger format to ensure clarity and reader comprehension. Providing a rich set of reference information required to interpret NIR spectra for research and industrial applications, this book: Offers more than 300 figures representing all the major functional groups and their NIR frequency ranges Contains over 120 pages of tables and charts illustrating overlapping spectra Covers NIR spectra for organic compounds, including alkanes, carboxylic acids, amines, dienes, alkynes, heterocyclic compounds, amino acids, and aldehydes Provides comprehensive appendices with spectra-structure correlations, example spectra, and other useful data for interpreting NIR spectra

Evaluation Technologies for Food Quality summarizes food quality evaluation technologies, which include sensory evaluation techniques and chemical and physical analysis. In particular, the book introduces many novel micro and nano evaluation techniques, such as atomic force microscopy, scanning electron microscopy, and other nanomaterial-based methods. All topics cover basic principles, procedures, advantages, limitations, recent technology development, and application progress in different types of foods. This book is a valuable resource for scientists in the field of food science, engineering, and professionals in the food industry, as well as for undergraduate and postgraduate students studying food quality evaluation technology. Explains basic principles, procedures, advantages, limitations, and current applications of recent food quality technologies Provides guidance on the understanding and application of food quality evaluation technology in the field of food research and food industry Introduces many novel micro/nano evaluation techniques, such as atomic force and scanning electron microscopies and other nanomaterial-based methods

The aim of this book is to present a range of analytical methods that can be used in formulation design and development and focus on how these systems can be applied to understand formulation components and the dosage form these build. To effectively design and exploit drug delivery systems, the underlying characteristic of a dosage form must be understood--from the characteristics of the individual formulation components, to how they act and interact within the formulation, and finally, to how this formulation responds in different biological environments. To achieve this, there is a wide range of analytical techniques that can be adopted to understand and elucidate the mechanics of drug delivery and drug formulation. Such methods include e.g. spectroscopic analysis, diffractometric analysis, thermal investigations, surface analytical techniques, particle size analysis, rheological techniques, methods to characterize drug stability and release, and biological analysis in appropriate cell and animal models. Whilst each of these methods can encompass a full research area in their own right, formulation scientists must be able to effectively apply these methods to the delivery system they are considering. The information in this book is designed to support researchers in their ability to fully characterize and analyze a range of delivery systems, using an appropriate selection of analytical techniques. Due to its consideration of regulatory approval, this book will also be suitable for industrial researchers both at early stage up to pre-clinical research.

This e-book includes the latest outcomes produced by a broad range of fNIRS research with activation of prefrontal cortex, from methodological one to clinical one, providing a forum for scientists planning functional studies of prefrontal brain activation. Reading this book, one will find the possibility that fNIRS could replace fMRI in the near future, and realize that even our aesthetic feeling is measurable. This will serve as a reference repository of knowledge from these fields as well as a conduit of information from leading researchers. In addition it offers an extensive cross-referencing system that will facilitate search and retrieval of information about NIRS measurements in activation studies. Researchers interested in fNIRS would benefit from an overview about its potential utilities for future research directions.

Delving into Infrared Spectroscopy: Principles, Advances and Applications, and with basic knowledge of IR spectroscopy, will provide the reader with a synopsis of fundamentals and groundbreaking advances in the field. Readers will see a variety of MIR applications and difficulties encountered, especially in an industrial environment. Competency in FT-IR spectroscopy in biomedical research and early-stage diagnosis of obesity is shown. Challenges associated with VIS-NIR applications are shown through application of the technique in assessing quality parameters of fruits. Moreover, IR spectroscopic studies of radiation-stimulated processes, and the influence of using IR in developing an ideal catalyst and hence an efficient catalysis process, are discussed. The impact of coupling multivariate data analysis techniques to IR is shown in almost every chapter.

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.

With contributions from over 40 experts in the field, this reference presents comprehensive, single-source coverage of the instrumentation, computerization, calibration, and methods development of NIR spectroscopy. It provides novel applications for accurate time- and cost-effective analyses of pharmaceuticals, polymers, textiles, agricultural products, dairy products, foods, and beverages. Emphasizing trends in sample preparation, the book covers historical development, calibration transfer, biomedical applications, plastics, and counterfeiting; on-line, in-line, and at-line analyses for process control, multilinear regression and principal component analysis, and more.

This book provides practical information on the use of infrared (IR) spectroscopy for the analysis of materials found in cultural objects. Designed for scientists and students in the

fields of archaeology, art conservation, microscopy, forensics, chemistry, and optics, the book discusses techniques for examining the microscopic amounts of complex, aged components in objects such as paintings, sculptures, and archaeological fragments. Chapters include the history of infrared spectroscopy, the basic parameters of infrared absorption theory, IR instrumentation, analysis methods, sample collection and preparation, and spectra interpretation. The authors cite several case studies, such as examinations of Chumash Indian paints and the Dead Sea Scrolls. The Institute's Tools for Conservation series provides practical scientific procedures and methodologies for the practice of conservation. The series is specifically directed to conservation scientists, conservators, and technical experts in related fields.

The present book is a definitive review in the field of Infrared (IR) and Near Infrared (NIR) Spectroscopies, which are powerful, non invasive imaging techniques. This book brings together multidisciplinary chapters written by leading authorities in the area. The book provides a thorough overview of progress in the field of applications of IR and NIR spectroscopy in Materials Science, Engineering and Technology. Through a presentation of diverse applications, this book aims at bridging various disciplines and provides a platform for collaborations among scientists.

Containing focused, comprehensive coverage, Practical Guide to Interpretive Near-Infrared Spectroscopy gives you the tools necessary to interpret NIR spectra. The authors present extensive tables, charts, and figures with NIR absorption band assignments and structural information for a broad range of functional groups, organic compounds, and [Copyright: 4ae0231512fd7125f2436d37db245e47](#)