

# INFRARED SPECTROSCOPY — FOR FOOD QUALITY — ANALYSIS AND CONTROL

Edited by  
**DA-WEN SUN**



# Infrared Spectroscopy For Food Quality Analysis And Control

**José Pinela, Lillian Barros, Spyridon  
Alexandros Petropoulos**



## **Infrared Spectroscopy For Food Quality Analysis And Control:**

Infrared Spectroscopy for Food Quality Analysis and Control Da-Wen Sun, 2009      **Infrared spectroscopy for food quality analysis and control** Da-Wen Sun, 2009 Annotation 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

**Infrared Spectroscopy for Food Quality Analysis and Control** Da-Wen Sun, 2009-03-05 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      **Advanced Spectroscopic Techniques for Food Quality** Ashutosh Kumar Shukla, 2022-05-20 The use of spectroscopy in food analysis is growing and this informative volume presents the application of advanced spectroscopic techniques in the analysis of food quality The spectroscopic techniques include visible and NIR spectroscopy FTIR spectroscopy and Laser induced Breakdown Spectroscopy LIBS A wide range of food and beverage items are covered including tea coffee and wine The chapters will highlight the potential of spectroscopic techniques to enrich the food quality analysis experience when coupled with artificial intelligence and machine learning and provide a good opportunity to assess and critically lay out any future prospects Different chapters have been written using a bottom up approach that suits the needs of novice researchers and at the same time offers a smooth read for professionals The book will also be of use to those developing spectroscopic facilities providing a useful cross comparison of the various techniques      **Emerging Technologies for Food Quality and Food Safety Evaluation** Yong-Jin Cho, Sukwon

Kang, 2011-03-09 Even though the perception of food quality may depend on its hedonic and often subjective attributes it is essential to quantitatively evaluate its quality and safety Fortunately the advent of sophisticated systems including nondestructive testing techniques has made it possible to definitively evaluate food quality Reflecting these advances

**Mathematical and Statistical Methods in Food Science and Technology** Daniel Granato, Gastón Ares, 2014-03-03 Mathematical and Statistical Approaches in Food Science and Technology offers an accessible guide to applying statistical and mathematical technologies in the food science field whilst also addressing the theoretical foundations Using clear examples and case studies by way of practical illustration the book is more than just a theoretical guide for non statisticians and may therefore be used by scientists students and food industry professionals at different levels and with varying degrees of statistical skill      **Electromagnetic Technologies in Food Science** Vicente M. Gómez-López, Rajeev Bhat, 2021-11-30 A

comprehensive source of in depth information provided on existing and emerging food technologies based on the electromagnetic spectrum Electromagnetic Technologies in Food Science examines various methods employed in food applications that are based on the entire electromagnetic EM spectrum Focusing on recent advances and challenges in food science and technology this is an up to date volume that features vital contributions coming from an international panel of experts who have shared both fundamental and advanced knowledge of information on the dosimetry methods and on potential applications of gamma irradiation electron beams X rays radio and microwaves ultraviolet visible pulsed light and more Organized into four parts the text begins with an accessible overview of the physics of the electromagnetic spectrum followed by discussion on the application of the EM spectrum to non thermal food processing The physics of infrared radiation microwaves and other advanced heating methods are then deliberated in detail supported by case studies and examples that illustrate a range of both current and potential applications of EM based methods The concluding section of the book describes analytical techniques adopted for quality control such as hyperspectral imaging infrared and Raman

spectroscopy This authoritative book resource Covers advanced theoretical knowledge and practical applications on the use of EM spectrum as novel methods in food processing technology Discusses the latest progress in developing quality control methods thus enabling the control of continuous fast speed processes Explores future challenges and benefits of employing electromagnetic spectrum in food technology applications Addresses emerging processing technologies related to improving safety preservation and overall quality of various food commodities Electromagnetic Technologies in Food Science is an essential reading material for undergraduate and graduate students researchers academics and agri food professionals working in the area of food preservation novel food processing techniques and sustainable food production Handbook of Research on Food Processing and Preservation Technologies Megh R. Goyal,Preeti Birwal,Monika Sharma,2022-02-28 The Handbook of Research on Food Processing and Preservation Technologies is a 5 volume collection that highlights various design development and applications of novel and innovative strategies for food processing and preservation Together the 5 volumes will prove to be valuable resource for researchers scientists students growers traders processors and others in the food processing industry Quality Control Applications in the Pharmaceutical and Medical Device Manufacturing Industry Carrillo-Cedillo, Eugenia Gabriela,Arredondo-Soto, Karina Cecilia,Palomino-Vizcaino, Kenia,Magaña-Badilla, Héctor Alfonso,2022-03-18 Quality control in pharmaceutical products and medical devices is vital for users as failing to comply with national and international regulations can lead to accidents that could easily be avoided For this reason manufacturing a quality medical product will support patient safety Microbiologists working in both the pharmaceutical and medical device industries face considerable challenges in keeping abreast of the myriad microbiological references available to them and the continuously evolving regulatory requirements Quality Control Applications in the Pharmaceutical and Medical Device Manufacturing Industry presents the importance of quality control in pharmaceutical products and medical devices which must have very high quality standards to not cause problems to the health of patients It reinforces and updates the knowledge of analytical instrumental and biological methods to demonstrate the correct quality control and good manufacturing practice for pharmaceutical products and medical devices Covering topics such as pharmaceutical nano systems machine learning and software validation this book is an essential resource for managers engineers supervisors pharmacists chemists academicians and researchers *Food Safety* Mohammed Kuddus,Syed Amir Ashraf,Pattanathu Rahman,2024-04-05 This book is an updated reference source on food safety best practices The chapters discuss analytical approaches to measuring food contaminants quality control and risk assessment of food storage food irradiation etc The contributors discuss how quality control and management help to establish sustainable and secure food systems globally The book covers topics such as techniques to measure food contaminants toxins heavy metals and pesticide content in food FEATURES Examines the role of food safety approaches in global food supply chains Describes various detection techniques for food contaminants and toxins Discusses the application of nanotechnology and other innovations in food safety and risk

assessment Reviews the international regulations for management of food hazards Includes the hazard analysis critical control points HACCP principles This book is an essential resource to help students researchers and industry professionals understand and address day to day problems regarding food contamination and safety and their impact on human health

Hyperspectral Imaging Analysis and Applications for Food Quality N.C. Basantia,Leo M.L. Nollet,Mohammed Kamruzzaman,2018-11-16 In processing food hyperspectral imaging combined with intelligent software enables digital sorters or optical sorters to identify and remove defects and foreign material that are invisible to traditional camera and laser sorters Hyperspectral Imaging Analysis and Applications for Food Quality explores the theoretical and practical issues associated with the development analysis and application of essential image processing algorithms in order to exploit hyperspectral imaging for food quality evaluations It outlines strategies and essential image processing routines that are necessary for making the appropriate decision during detection classification identification quantification and or prediction processes Features Covers practical issues associated with the development analysis and application of essential image processing for food quality applications Surveys the breadth of different image processing approaches adopted over the years in attempting to implement hyperspectral imaging for food quality monitoring Explains the working principles of hyperspectral systems as well as the basic concept and structure of hyperspectral data Describes the different approaches used during image acquisition data collection and visualization The book is divided into three sections Section I discusses the fundamentals of Imaging Systems How can hyperspectral image cube acquisition be optimized Also two chapters deal with image segmentation data extraction and treatment Seven chapters comprise Section II which deals with Chemometrics One explains the fundamentals of multivariate analysis and techniques while in six other chapters the reader will find information on and applications of a number of chemometric techniques principal component analysis partial least squares analysis linear discriminant model support vector machines decision trees and artificial neural networks In the last section Applications numerous examples are given of applications of hyperspectral imaging systems in fish meat fruits vegetables medicinal herbs dairy products beverages and food additives

**Non-invasive and Non-destructive Methods for Food Integrity** Ana María Jiménez-Carvelo,Alejandra Arroyo-Cerezo,Luis Cuadros-Rodríguez,2024-12-16 There is an increasing need for the food industry to provide information to ensure quality requirements and prevent the food fraud applying in situ and on line technologies for full process control along the food chain In today s information age consumers want to be able to have as much information as possible about products quickly and efficiently Therefore the rapid detection of indicators that determine food quality and safety risks helps to ensure an effective and comprehensive food sovereignty system For this purpose the most powerful and commonly used analytical techniques are liquid or gas chromatography both coupled to different detection systems The use of these analytical techniques involves long analysis times and prior procedures of fitness for measuring such as sample pre treatment in which the use of reagents and chemical solvents that may be hazardous or

harmful to the environment is common. These facts highlight the need for the development of new analytical methods that offer the possibility of rapid non-invasive on-site environmentally friendly analyses that can be carried out along the entire production chain. In addition, recent technological developments and advances in data mining and machine learning offer the opportunity to introduce changes that could transform the role of food integrity. *Non-invasive and Non-destructive Methods for Food Integrity* is dedicated to describing the fundamentals and applications of existing analytical technologies and the current state of these techniques at industrial level. The text utilizes reported studies and applications differentiating by particular food and beverage groups in order to provide a comprehensive and detailed overview of the current state of the art of non-invasive non-destructive analytical techniques for food quality and integrity. For each technique covered, an introduction is included, and the chemical information obtained and why this technology is useful for food analysis. Information on the instrumentation available for the application of each technique in food is also provided, as well as information on data processing with reference to the treatment of the signal obtained and the use of chemometrics. Applications published in scientific literature are detailed for different categories of similar foods based on the techniques that are already used for the routine control of food integrity. This book provides guidance for potential users in the food industries and quality control laboratories for choosing which technology to implement based on the type of product and the results to be obtained.

Novel Food Preservation and Microbial Assessment Techniques Ioannis S. Boziaris, 2014-04-14. Demand for minimally processed foods has resulted in the development of innovative non-thermal food preservation methods such as high pressure, sonication, ozone, and UV treatment. This book presents a summary of these novel food processing techniques. It also covers new methods used to monitor microbial activity, including spectroscopic methods (FT-IR and Raman), molecular and electronic noses, and DNA-based methods. *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. **Food Quality Analysis** Ashutosh Kumar

Shukla,2022-11-18 Food Quality Analysis Applications of Analytical Methods Coupled With Artificial Intelligence provides different spectroscopic techniques and their application to food quality analysis with the unique approach of adding multivariate analysis as well as artificial intelligence applications It also brings chromatographic methods for the analysis of a wide range of food items including wheat flours oils and fats Written by a team of interdisciplinary experts this is a valuable resource for researchers and personnel involved in food industries Covers food quality analysis experience combined with spectroscopic techniques artificial intelligence and machine learning Presents the applications of analytical techniques to speed up the resolution of food safety issues prevent food fraud and traceability purposes Explores different spectroscopic techniques and their application to food quality analysis      **Chemical Identification and its Quality Assurance** Boris L.

Milman,2013-06-17 This is the first book to show how to apply the principles of quality assurance to the identification of analytes qualitative chemical analysis After presenting the principles of identification and metrological basics the author focuses on the reliability and the errors of chemical identification This is then applied to practical examples such as EPA methods EU FDA or WADA regulations Two whole chapters are devoted to the analysis of unknowns and identification of samples such as foodstuffs or oil pollutions Essential reading for researchers and professionals dealing with the identification of chemical compounds and the reliability of chemical analysis      Advances in Food and Nutrition Research ,2010-08-19

Advances in Food and Nutrition Research recognizes the integral relationship between the food and nutritional sciences and brings together outstanding and comprehensive reviews that highlight this relationship Contributions detail scientific developments in the broad areas of food science and nutrition and are intended to provide those in academia and industry with the latest information on emerging research in these constantly evolving sciences The latest important information for food scientists and nutritionists Peer reviewed articles by a panel of respected scientists The go to series since 1948

**Advances in Tomato and Tomato Compounds Research and Technology** José Pinela,Lillian Barros,Spyridon Alexandros Petropoulos,2022-10-12      *Sensor-Based Quality Assessment Systems for Fruits and Vegetables* Bambang Kuswandi,Mohammed Wasim Siddiqui,2020-12-17 Here is an abundance of valuable information on different sensing techniques for fruits and vegetables The volume covers emerging technologies such as NMR MRI wireless sensor networks WSN and radio frequency identification RFID and their potential for industrial applications Key features of the volume Provides an inclusive review of the developments of sensors for quality analysis and inspection of fresh fruits and vegetables Fosters an understanding of the basic sensing techniques for quality assessment of fresh fruits and vegetables Covers advanced sensing technologies including computer vision spectroscopy X rays magnetic resonance mechanical contact wireless sensor networks and radio frequency identification sensors Reviews the significant progress in sensor development of noninvasive techniques for quality assessment of fruits and vegetables      *Applied Reliability and Quality* Balbir S. Dhillon,2007-02-23 Billions of dollars are being spent annually world wide to develop reliable and good quality products and



services Global competition and other factors are forcing manufacturers and others to produce highly reliable and good quality products and services This means that reliability and quality principles are now being applied across many diverse sectors of economy and each of these sectors robotics health care power generation the Internet textile food and software has tailored reliability and quality principles methods and procedures to satisfy its specific need Reliability and quality professionals working in these areas need to know about each other s work activities because this may help them directly or indirectly to perform their tasks more effectively Applied Reliability and Quality Fundamentals Methods and Procedures meets the need for a single volume that considers applied areas of both reliability and quality Before now there has not been one book that covers both applied reliability and quality so to gain knowledge of each other s specialties these people had to study various books articles or reports on each area As the first book of its kind Applied Reliability and Quality Fundamentals Methods and Procedures will be useful to design engineers manufacturing engineers system engineers engineering and manufacturing managers reliability specialists quality specialists graduate and senior undergraduate students of engineering researchers and instructors of reliability and quality and professionals in areas such as health care software power generation robotics textile food and the Internet

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