Kursus Penulisan & Penerbitan Buku Penyelidikan

10&11 Jun 2015

Rosli Hussin

Pengerusi Panel Buku Penyelidikan & Book Chapters
Penerbit UTM Press &
Jabatan Fizik, Fakulti Sains
Universiti Teknologi Malaysia, Johor

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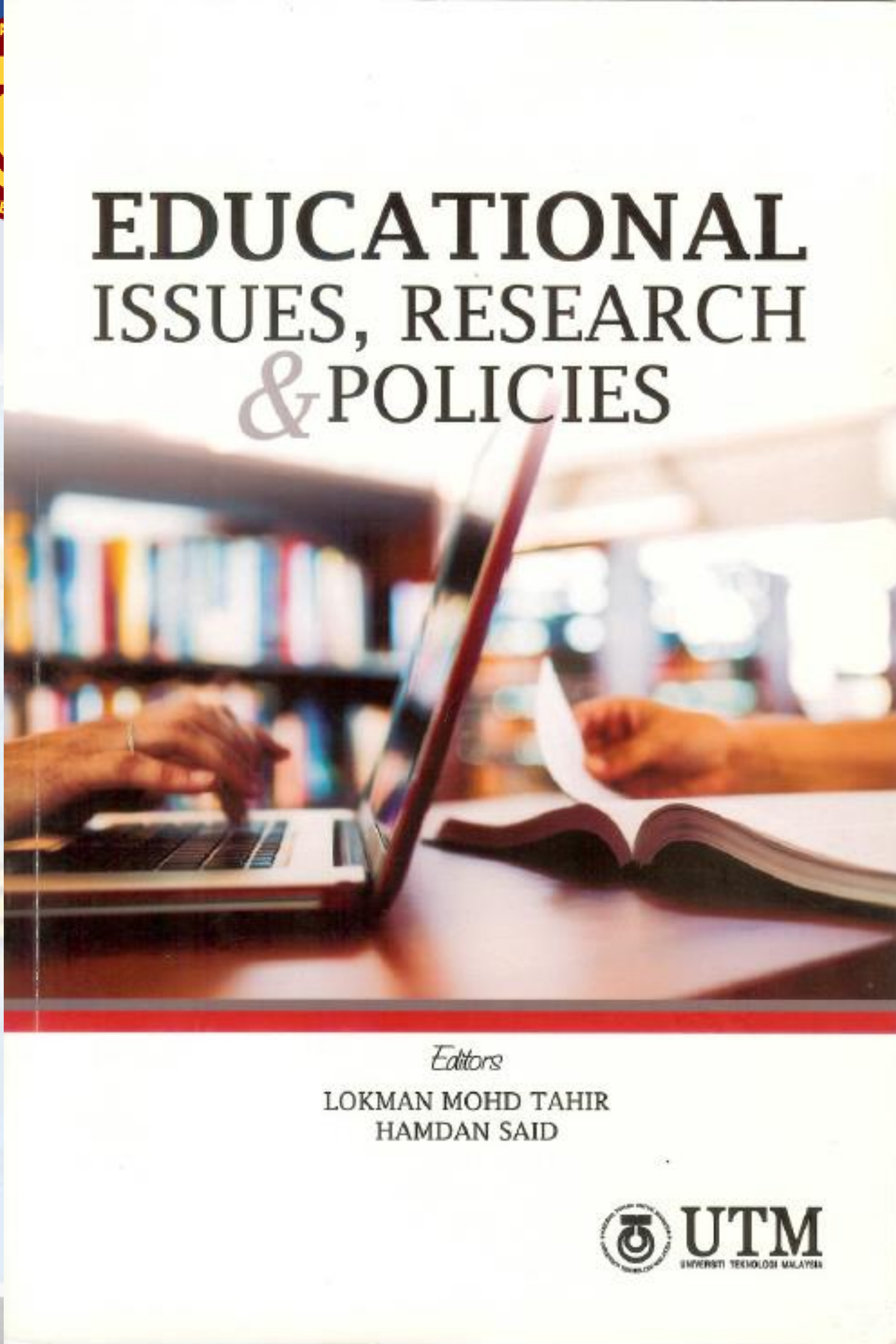

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TOO DIFFICULT TO REACH: A CASE STUDY OF THE IMPLEMENTATION OF TEACHING-LEARNING WITH ENGLISH IN INDONESIA'S INTERNATIONAL STANDARD SCHOOLS

Bambang Sumintono, Nora Mislan, Hassan Hushin

1.1 INTRODUCTION

The fast changing world and global interconnectedness have led to many changes which have impacted on education. To name a few, schools in developed countries face many challenges conforming to standards-based reform, public accountability, school based management, and digital technologies (Hopkins and Jackson, 2003). Such situations have made governments in developing countries, including Indonesia, take initiatives by imposing policies on their school system to keep the educational sector in line with the global challenge.

Meanwhile in Indonesia, significant change to educational sector followed the collapse of the New Order regime in 1998 and devolution of responsibilities to provincial and district administrations. This can be seen in the fourth Constitutional Amendments which stipulated that at least 20 percent of state

2

INTERNATIONALIZATION OF HIGHER EDUCATION IN MALAYSIAN PUBLIC INSTITUTIONS: CONCEPT, RATIONALE AND STRATEGY

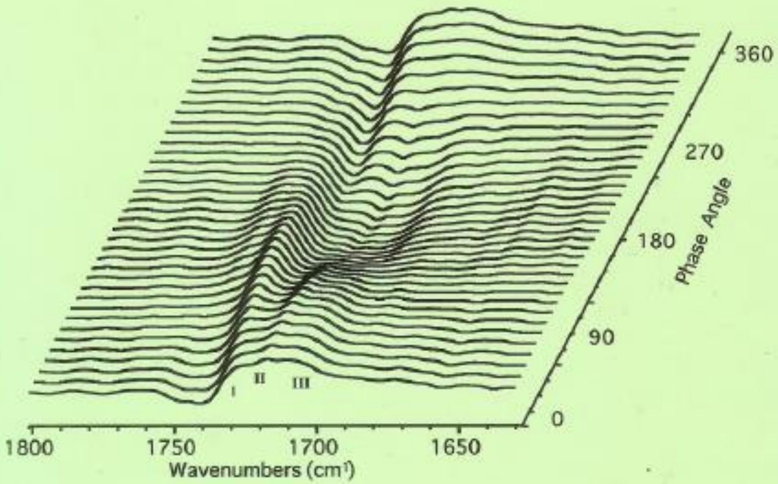
Sanitah Mohd Yusof, Zaitun Sidin

2.1 INTRODUCTION

> *Universities have always figured in the global environment and thus been affected by circumstances beyond the campus and across national borders. This reality is too often forgotten in analysis of 21st century globalization (Altbach, 2004).*

The quotation above indicates that universities cannot be isolated from the outside world. Universities elements such as students, faculties and administrative are very mobile. They are also profoundly affected by the global environment such as interaction with different cultural and ethnic background partly contributed by advances in technology. Higher Education Institutions (HE) now encounter greater challenges. Resource everywhere is scarce. HE have to accommodate the increasing need for professional personnel from knowledge based economies, a growing demand

Vibrational Spectroscopy of Biological and Polymeric Materials



edited by
Vasilis G. Gregoriou
Mark S. Braiman

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Chemistry

Used primarily for characterizing polymers and biological systems, vibrational spectroscopy continues to uncover structural information pertinent to a growing number of applications. **Vibrational Spectroscopy of Biological and Polymeric Materials** compiles the latest developments in advanced infrared and Raman spectroscopic techniques that are applicable to both polymeric materials and biological compounds. It also presents instrumentation and experimental details that can be used by polymer chemists and biochemists in the design of their own experiments.

The book discusses static and dynamic FT-IR spectroscopies to liquid crystalline polyurethanes. It discusses the measurement of static and dynamic linear dichroism and stress or strain in both single and multiple fiber composite materials, the roles of vibrational spectroscopy, and the Langmuir-Blodgett technique in the study and preparation of high-quality ultrathin materials. The book also covers two-dimensional correlation spectroscopy, vibrational circular dichroism, focal-plane arrays, the use of ligand-gated FT-IR difference spectroscopy in neuropharmacology, and the application of time-resolved FT-IR spectroscopy to biological materials.

Features

- Demonstrates methods that take advantage of recently available mid-IR multichannel detectors
- Outlines the development of modeling methods, utilizing both small molecules and computations
- Describes imaging techniques that utilize molecular vibrational spectroscopy
- Offers techniques for identifying ligands and modes of ligand action for the large number of membrane receptors recently identified in the human genome
- Considers transmission and reflection measurements applied to a wide variety of thin films
- Includes advances in microscopic mid-IR multichannel detectors combined with interferometers
- Provides a detailed guide to the use of commercial step-scan instrumentation for examining sub-millisecond mechanistic details of photobiological processes

Written by eminent experts in these fields, **Vibrational Spectroscopy of Biological and Polymeric Materials** is an ideal and practical reference for the broad spectrum of researchers interested in the analysis and integration of biological and polymeric materials.

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ISBN 1-57444-539-1
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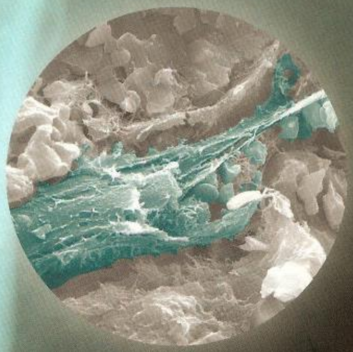
Characterization of Biomaterials



Edited by
Amit Bandyopadhyay
Susmita Bose

Material Science and Engineering

Characterization of Biomaterials

One of the key challenges current biomaterials researchers face is identifying which of the dizzying number of highly specialized characterization tools can be gainfully applied to different materials and biomedical devices. Since this diverse marketplace of tools and techniques can be used for numerous applications, choosing the proper characterization tool is highly important, saving both time and resources.

Characterization of Biomaterials is a detailed and multidisciplinary discussion of the physical, chemical, mechanical, surface, ***in vitro*** and ***in vivo*** characterization tools and techniques of increasing importance to fundamental biomaterials research.

KEY FEATURES

- The work comprises contributions from a cross-section of the physical sciences, biological sciences, engineering and applied sciences characterization community, providing researchers with gainful and cross-cutting insight into this highly multi disciplinary field
- Detailed coverage of important test protocols helps researchers by providing specific real-world examples and standards for applied characterization
- Detailed discussion on both biomaterials and biomedical device characterization issues and related standards to follow for regulatory purposes
- Special emphasis on orthopaedic and cardiovascular devices

Characterization of Biomaterials will serve as a comprehensive resource for biomaterials researchers requiring detailed information on physical, chemical, mechanical, surface, ***in vitro*** or ***in vivo*** characterization. The book is designed for materials scientists, bioengineers, biologists, clinicians and biomedical device researchers seeking input towards planning on how to test their novel materials or structures or biomedical devices towards a specific application. Chapters are developed considering the need for both industrial researchers as well as academics.

About the editors:

Amit Bandyopadhyay is a professor of Mechanical and Materials Engineering at Washington State University (WSU). He has written over 225 technical papers and holds 8 US patents, a Fellow of the American Ceramic Society, American Society for Materials, the American Institute for Medical and Biological Engineering (AIMBE) and the AAAS.

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ISBN 978-0-12-415800-9

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Chapter 1

Introduction to Biomaterials

Susmita Bose and Amit Bandyopadhyay

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1.1. INTRODUCTION

With the evolution of human civilization, the field of biomaterials evolved involving different materials at multiple length scales from nano- to micro- to macrolevel with a simple focus to extend human life and improve the quality of life. Over 1000 years back, silver in different forms was used as an antimicrobial agent to prevent infection. Different types of surgical procedures can also be found during early stages of civilization. However, probably the most significant developments took place in the field of biomaterials over the years 1901–2000. Artificial joints improved the quality of life for millions of people over the past 60 years, resorbable sutures simplified surgical procedures, and different cardiovascular devices saved millions of lives, just to name a few. The advent of tissue engineering and organ regeneration is pushing the frontiers of science today to make the years 2001–2100 more exciting in the field of biomaterials. However, to appreciate the benefits, it is not just the design of biomaterials that is important, but sound engineering design and appropriate materials and device characterization are also needed. Moreover, for a biomedical device to see the commercialization light, it is also important to carry out testing following appropriate standards to get regulatory approval. Overall, benefits of biomaterials research can only be appreciated when these

Characterization of Biomaterials. http://dx.doi.org/10.1016/B978-0-12-415800-9.00001-2

Chapter 2

Physical and Chemical Characterization of Biomaterials

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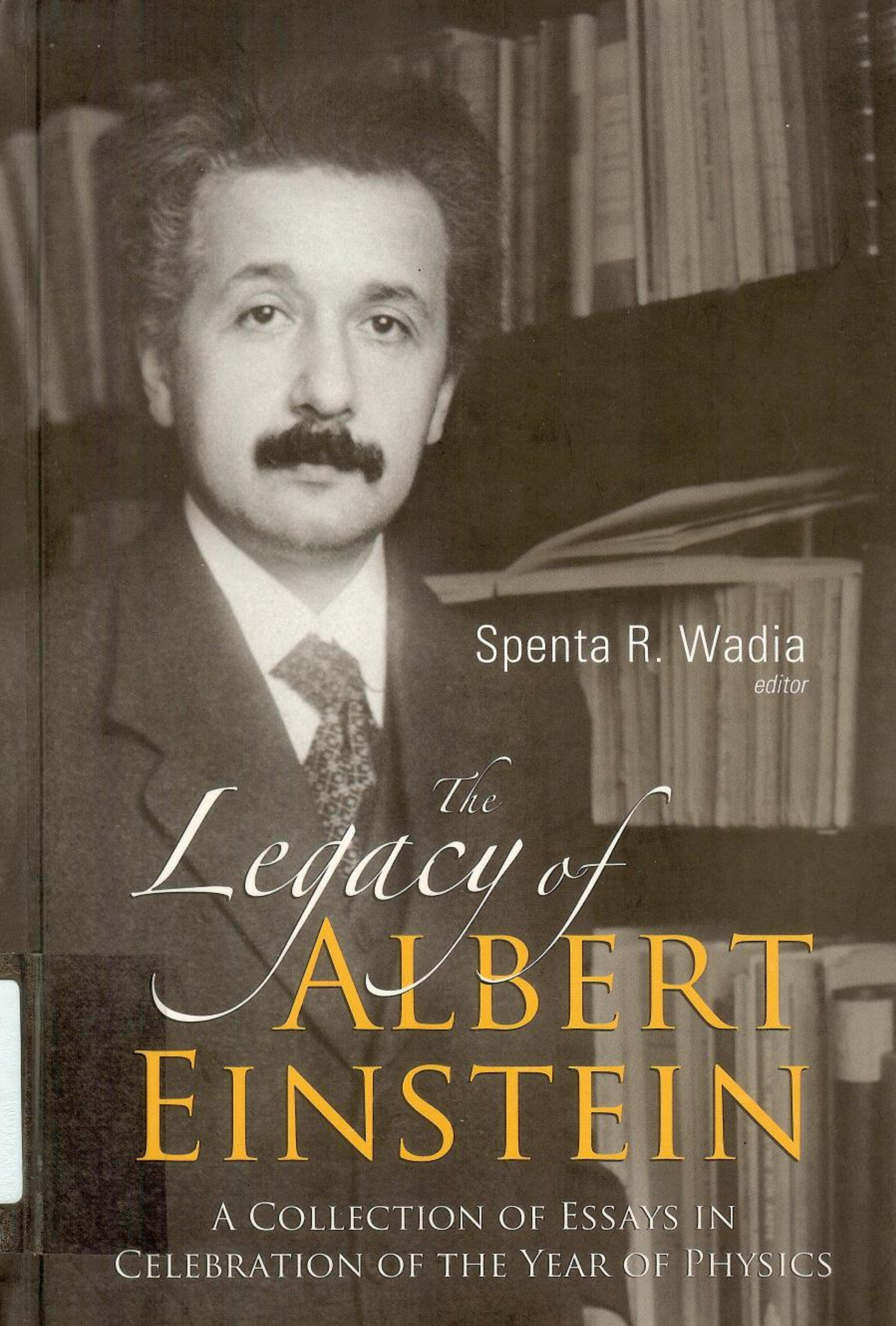
2.1. MICROSTRUCTURAL CHARACTERIZATION

The physical, chemical and often mechanical properties of materials are interrelated to its internal microstructural features. The microstructure of the material involves specifying the crystallography, morphology and chemical composition of the material. Crystallographic analysis includes identifying the different phases which are present in the structure of the material and the nature of the atomic packing within the phases. Most phases are crystalline phases with highly ordered and regularly repeated arrangement of atoms. But some phases are amorphous or glassy, which do not posses any long-range ordered arrangement of atoms. The morphological analysis corresponds to the characterization of the size, shape and spatial distribution of the phases or particles. As stated above, the compositional analysis involves identification of the chemical constituents of the material and its relative abundance. In all the cases

Characterization of Biomaterials. http://dx.doi.org/10.1016/B978-0-12-415800-9.00002-4



Spenta R. Wadia
editor

The Legacy of ALBERT EINSTEIN

A COLLECTION OF ESSAYS IN CELEBRATION OF THE YEAR OF PHYSICS

The Legacy of ALBERT EINSTEIN

This indispensable volume contains a compendium of articles covering a vast range of topics in physics which were begun or influenced by the works of Albert Einstein: special relativity, quantum theory, statistical physics, condensed matter physics, general relativity, geometry, cosmology and unified field theory. An essay on the societal role of Einstein is included. These articles, written by some of the renowned experts, offer an insider's view of the exciting world of fundamental science.

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ISBN-13 978-981-270-049-0
ISBN-10 981-270-049-8
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CHAPTER 1

Einstein and the Search for Unification

****

DAVID GROSS

Department of Physics, University of California, Santa Barbara, CA 93106, USA

Einstein spent the last thirty years of his life searching for a unified field theory. I discuss Einstein's attempts at unification. I examine his mistakes, ask why he went wrong, and wonder what might have happened if he had followed a slightly different route. I then discuss, very briefly, where we stand today in realizing Einstein's goals.

My topic is at the heart of Einstein's scientific life, the search for a unified theory of nature. This was Einstein's main pursuit for more than half of his scientific career. Most contemporaries viewed his attempts as a waste of time, a total failure or, at best, premature. But today we look with some admiration at his foresight. Having understood by the middle 1970's, to a large extent, all the four forces of nature in the remarkable successful standard model, attention has returned to Einstein's dream of unifying all the forces with gravity. The goal of unification has been at the forefront of fundamental physics for the last three decades.

In this article I shall, fully aware of the ease of hindsight, discuss Einstein's goals, his attempts to unify general relativity and electromagnetism, and to include matter. I shall discuss his mistakes, ask why he went wrong, and wonder what might have happened if he had followed a slightly different route. As I am not a professional historian I can get away with murder. I shall then discuss, very briefly, where we stand today in realizing Einstein's goals.

For many physicists, certainly me, Einstein is both a hero and a model. He stated the goals of fundamental physics, that small part of physics that probes the frontiers of physics in a search for the underlying laws and principles of nature. Einstein was a superb epigramist, who could capture in a single sentence many deep thoughts.

CHAPTER 2

Einstein and Geometry

****

MICHAEL ATIYAH

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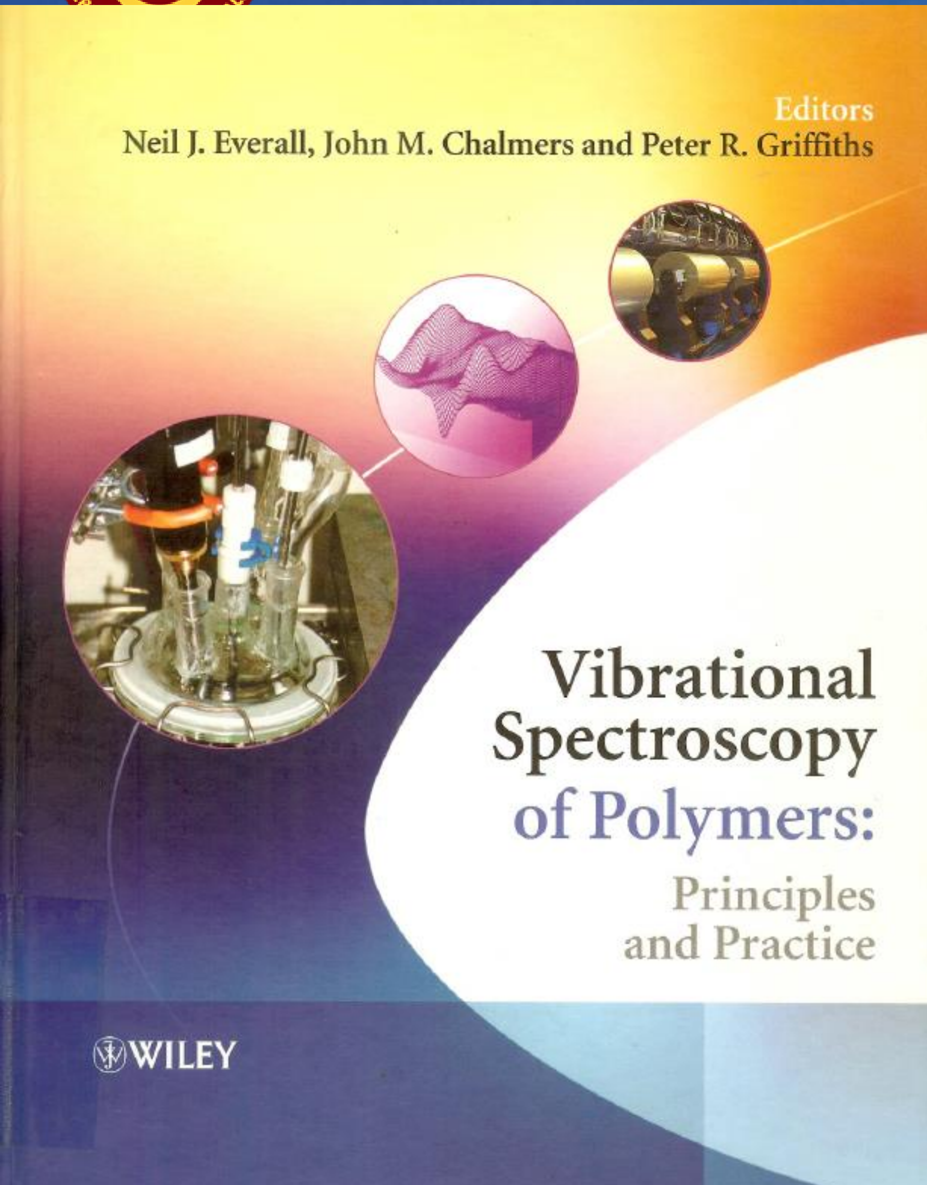
Einstein initiated and stressed the role of geometry in fundamental physics. Fifty years after his death the links between geometry and physics have been significantly extended with benefits to both sides.

1. General Relativity

Einstein is generally recognized as the greatest physicist of the 20th century and perhaps the greatest physicist since Newton, though Faraday and Clerk Maxwell are close competitors. Einstein is a case where popular acclaim and scientific standing are in agreement. But unlike Newton, Einstein was not a mathematician. He used mathematics in an essential way but he did not create it and he relied on his colleagues for technical help. It is all the more remarkable that his ideas have triggered great advances in geometry, even in parts of the subject apparently far removed from physics.

I will attempt to describe and explain how this has come about. But first I should make some general remarks about the relation between physics and mathematics. The conventional view is that mathematicians have developed machinery for studying numbers (which might represent physical quantities) and the way in which those relate to each other in the form of equations. Physicists then use this language and embody their conclusions in 'laws' described by equations. Thus Newton's gravitational theory is described by the inverse square law of mutual attraction, while the fundamental laws of electromagnetism are encoded in Maxwell's equations.

While this orthodox view is formally correct, it hides some essential features. In physics the starting points are the concepts: particles, forces,



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Neil J. Everall, John M. Chalmers and Peter R. Griffiths

Vibrational Spectroscopy of Polymers:

Principles and Practice

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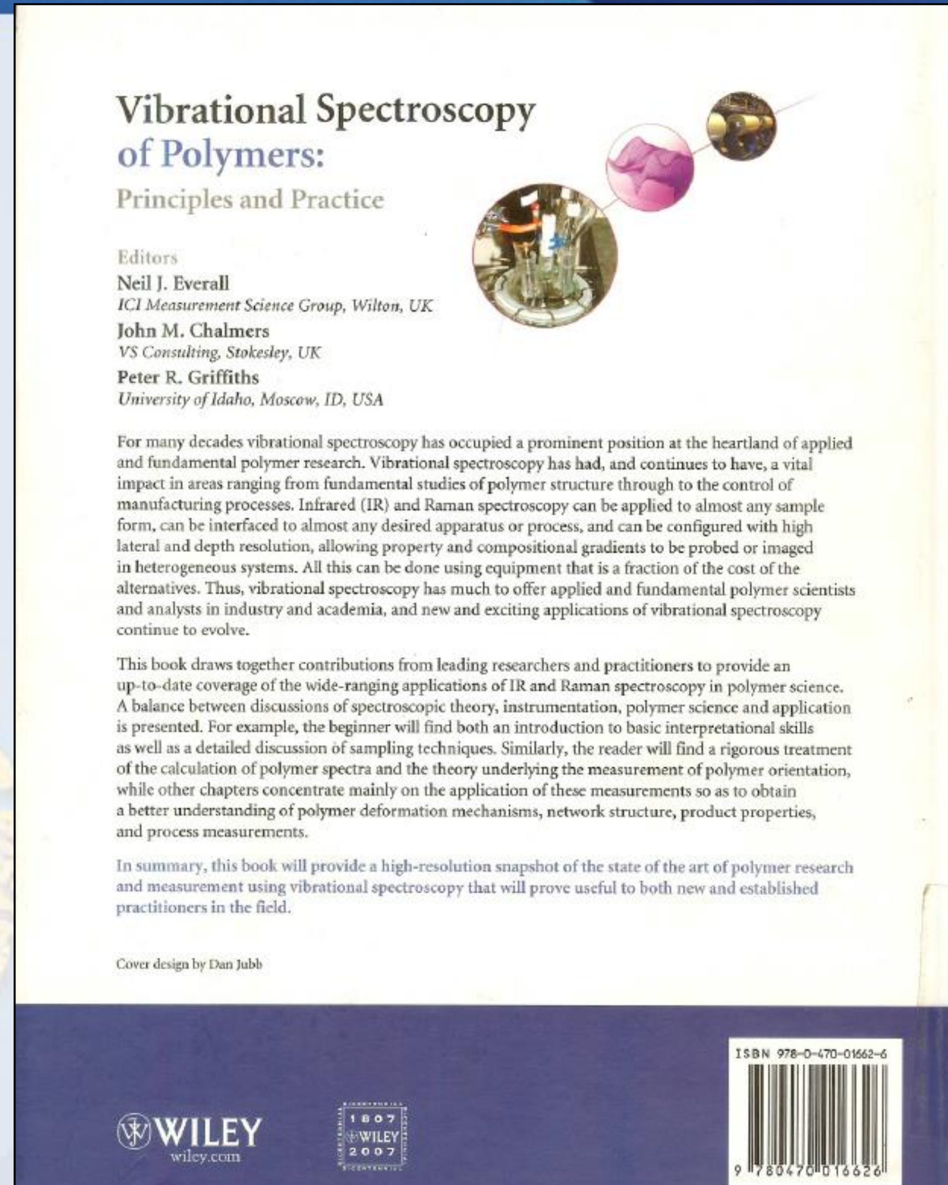

Vibrational Spectroscopy of Polymers:

Principles and Practice

Editors

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For many decades vibrational spectroscopy has occupied a prominent position at the heartland of applied and fundamental polymer research. Vibrational spectroscopy has had, and continues to have, a vital impact in areas ranging from fundamental studies of polymer structure through to the control of manufacturing processes. Infrared (IR) and Raman spectroscopy can be applied to almost any sample form, can be interfaced to almost any desired apparatus or process, and can be configured with high lateral and depth resolution, allowing property and compositional gradients to be probed or imaged in heterogeneous systems. All this can be done using equipment that is a fraction of the cost of the alternatives. Thus, vibrational spectroscopy has much to offer applied and fundamental polymer scientists and analysts in industry and academia, and new and exciting applications of vibrational spectroscopy continue to evolve.

This book draws together contributions from leading researchers and practitioners to provide an up-to-date coverage of the wide-ranging applications of IR and Raman spectroscopy in polymer science. A balance between discussions of spectroscopic theory, instrumentation, polymer science and application is presented. For example, the beginner will find both an introduction to basic interpretational skills as well as a detailed discussion of sampling techniques. Similarly, the reader will find a rigorous treatment of the calculation of polymer spectra and the theory underlying the measurement of polymer orientation, while other chapters concentrate mainly on the application of these measurements so as to obtain a better understanding of polymer deformation mechanisms, network structure, product properties, and process measurements.

In summary, this book will provide a high-resolution snapshot of the state of the art of polymer research and measurement using vibrational spectroscopy that will prove useful to both new and established practitioners in the field.

Cover design by Dan Jubb

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ISBN 978-0-470-01662-6

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Qualitative and Quantitative Analysis of Plastics, Polymers and Rubbers by Vibrational Spectroscopy

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[2] *ICI Measurement Science Group, Wilton, UK*

1 INTRODUCTION

Infrared (IR) spectroscopy has a long tradition and remains one of the most widely used spectroscopic techniques in the analysis and characterization of organic polymers, plastics[a] and rubbers, and their products. While Raman spectroscopy using visible lasers has also been used for many years to study polymers, severe interference because of fluorescence frustrated many of the early applications to industrial polymers. This bugbear has now been largely circumvented through the use of various long wavelength (>700 nm) laser-excited dispersive Raman, and near-infrared (NIR) laser-excited Fourier transform (FT)-Raman, instrumentation. Additionally, modern polymers are often "cleaner", with lower impurities (e.g., catalyst residues) of the type that used to cause strong fluorescence a few decades ago. Consequently, the full potential of Raman and its sampling advantages are now being mostly realized in the analysis, study, and characterization of polymers and rubbers. IR and Raman spectroscopy are used both to identify materials and to probe the molecular microstructure and morphology of complex macromolecules and articles fabricated from them. There are many reviews and books on the subjects of polymer research and characterization by vibrational spectroscopy. They cover vibrational spectroscopy fundamentals through to experimental practice.[1–14]

This chapter begins with a short discussion on the range of sample forms and properties that are amenable to study using vibrational spectroscopy. This is followed by concise descriptions of sampling techniques as they apply to polymer analysis. Discussions of qualitative and quantitative analysis and the peculiarities associated with polymer IR and Raman spectra are then followed by more specific applications sections. This chapter is essentially a prelude to the more specific and specialized chapters that follow in this book. NIR analyses are not specifically

Vibrational Spectroscopy of Polymers: Principles and Practice. Edited by Neil J. Everall, John M. Chalmers and Peter R. Griffiths. © 2007 John Wiley & Sons, Ltd. ISBN: 978-0-470-01662-6.

ACKNOWLEDGMENTS

We owe a debt of gratitude to many past and present colleagues, friends and collaborators in ICI plc and elsewhere. Part of the IR coverage in this chapter is based on the article by one of us (JMC), "Infrared Spectroscopy in Analysis of Polymers and Rubbers", in "Encyclopedia of Analytical Chemistry", ed R.A. Meyers, John Wiley & Sons, Chichester, Vol. 9, 7702–7759 (2000). One of us (NJE) acknowledges ICI for granting permission to publish this chapter.

END NOTES

[a] Plastic/plastics as used in this chapter is clearly the common everyday usage and commercial phraseology that applies to synthetic organic polymers and their products

[b] The interference fringe spacing may be used to calculate the polymer film sample thickness from the equation $t = N/2n(\nu_2 - \nu_1)$, where the film thickness is t, N is the number of complete fringes between wavenumber ν_2 and ν_1, and n is the refractive index of the film material.

[c] In this paper, reference 25, two errata occurred in the published text. On page 50, the sampling depth of photoacoustic spectroscopy was printed as "from several to 100 mm or greater"; it should have read "from several to 100 µm or greater". On page 54, in the section on FT-IR microscopy, the sentence beginning, "For characterizing thick coating/surface layers (ca. ≥10 mm thickness)", should have read, "For characterizing thick coating/surface layers (ca. ≥10 µm thickness)". These errata were published and corrected in a later edition of the journal.

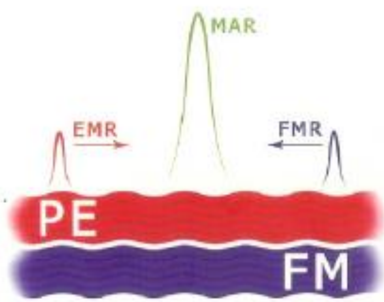
[d] It should be noted that in this reference, that, while the captions to Figures 3 and 6 are correct, the Figures have been wrongly inserted; Figure 3 should be Figure 6, and Figure 6 should be Figure 3.

ABBREVIATIONS AND ACRONYMS

ATR	Attenuated Total Reflection
BuA	Butyl Acrylate
CCD	Charge-Coupled Device
CLS	Classical Least Squares
DIRLD	Dynamic Infrared Linear Dichroism
DR	Diffuse Reflection
DRIFT	Diffuse Reflection Infrared Fourier Transform
DSC	Differential Scanning Calorimetry
EGA	Evolved Gas Analysis
EPDM	Ethylene-Propylene-Diene Monomer
ESCA	Electron Spectroscopy for Chemical Analysis
EVA	Ethylene/Vinyl Acetate
FT	Fourier Transform
FT-IR	Fourier Transform Infrared
GC	Gas Chromatography
GPC	Gel Permeation Chromatography
HA	Hydroxyapatite
H-ATR	Horizontal Attenuated Total Reflection
HDDA	1,6-Hexanediol Diacrylate
HDPE	High-Density Poly(Ethylene)
IPN	Interpenetrating Polymer Network
IRE	Internal Reflection Element
IR	Infrared
IRRAS	Infrared Reflection-Absorption Spectroscopy
LC	Liquid Chromatography
LDPE	Low-Density Poly(Ethylene)
LEDs	Light-Emitting Polymer Diodes
MALDI	Matrix-Assisted Laser Desorption
MCR	Multivariate Curve Resolution
MD	Machine Draw
MIR	Multiple Internal Reflection
MMA	Methyl Methacrylate
MS	Mass Spectrometry
NCA	Normal Coordinate Analysis
NIR	Near-Infrared
NMR	Nuclear Magnetic Resonance
PA	Photoacoustic
PANI	Polyaniline
PBD	Poly(Butadiene)
PBT	Poly(Butylene Terephthalate)
PCL	Poly(ε-Caprolactone)

Editors
Mirza I. Bichurin
Dwight Viehland

MAGNETOELECTRICITY IN COMPOSITES



"Magnetoelectricity in Composites is an excellent text covering fundamentals of analytical modeling, material behaviour and experiments. The book is a must read for researchers investigating new connectivity patterns in piezoelectric-magnetostrictive materials."

Prof. Shashank Priya
Virginia Tech, USA

"This interesting book, which comes at the right time, is a concentrate of the most recent scientific discoveries in composite multiferroics. Written by highly recognized authors in the field, it is an excellent reference for inspiring researchers, especially for young scientists and students!"

Prof. Anatoly Zvezdin
Russian Academy of Sciences, Russia

Magnetoelectric (ME) composites, which simultaneously exhibit ferroelectricity and ferromagnetism, have recently stimulated a sharply increasing number of research activities for their scientific interest and significant technological promise in the novel multifunctional devices. Natural single-phase compounds are rare, and their magnetoelectric responses are either relatively weak or occur at temperatures too low for practical applications. In contrast, composites that incorporate both ferroelectric and ferri-/ferromagnetic phases typically yield giant magnetoelectric coupling response above room temperature, which makes them ready for technological applications. In such composites, the magnetoelectric effect is generated as a product property of a magnetostrictive and a piezoelectric substance. Appropriate choice of phases with high magnetostriction and piezoelectricity has allowed the achievement of ME voltage coefficients necessary for engineering applications over a wide frequency bandwidth including the electromechanical, magnetoacoustic, and ferromagnetic resonances regimes.

The authors of this book bring together numerous contributions to the field of ME composites that have been reported since the beginning of the new millennium. They present to the readers new to the field a coherent and lucid assimilation of facts into the established knowledge.

Interestingly, motivated by on-chip integration in microelectronic devices, nanostructured composites of ferroelectric and magnetic oxides have recently been deposited in a film-on-substrate geometry. The authors discuss these bulk and nanostructured magnetoelectric composites from both experimental and theoretical perspectives. From application viewpoint, microwave devices, sensors, transducers, and heterogeneous read/write devices are among the suggested technical implementations of magnetoelectric composites.

Mirza I. Bichurin is a professor in and head of the Department of Design and Technology of Radioelectronic Equipment at Novgorod State University. A world-renowned and multiple-award-winning expert at magnetic and electric properties of composites, multilayer and bulk magnetoelectric structures, and radio- and microwave electronics, Prof. Bichurin has to his credit more than 150 articles published in international refereed journals, 15 patents, and 5 books.

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V137
ISBN-13 978-981-4267-79-3
9 789814 267793

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Chapter 1

Magnetoelectric Interaction in Magnetically Ordered Materials (Review)

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This chapter reviews magnetoelectric (ME) interaction in magnetically ordered materials. We discuss the ME properties of magnetostrictive-piezoelectric composites to create new ME composites with enhanced ME couplings that would enable them for application in functional electronics devices. One of the main objectives is a comparative analysis of ME composites that have different connectivity types. It was significant to note that the relative simplicity of manufacturing multilayer composites with a 2–2 type connectivity having giant ME responses is an important benefit. In addition, composites with 3–0 and 0–3 connectivity types are also easy to make using a minimum monitoring of the synthesis process. The ultimate purpose of theoretical estimates is to predict the ME parameters — both susceptibility and voltage coefficients

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Chapter 2

Effective Medium Approach: Low-Frequency Range

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The subject of this chapter is the theoretical modeling of low-frequency magnetoelectric (ME) effect in layered and bulk composites based on magnetostrictive and piezoelectric materials. Our analysis rests on the effective medium theory. The expressions for effective parameters including ME susceptibilities and ME voltage coefficients as the functions of interface parameter, material parameters, and volume fractions of components are obtained. Longitudinal, transverse, and in-plane cases are considered. The use of the offered model has allowed to present the ME effect in ferrite cobalt–barium titanate, ferrite cobalt–PZT, ferrite nickel–PZT, lanthanum strontium manganite–PZT composites adequately for the first time. For layered ferrite–piezoelectric composite the Maxwell-Wagner relaxation of ME susceptibility and ME voltage coefficient, which has Debay character and for ME susceptibility is normal and for ME voltage coefficient is inverse, is found. In ferrite–piezoelectric bulk composite the Maxwell-Wagner relaxation of ME susceptibility and ME voltage coefficient, which for ME voltage coefficient is inverse and for ME susceptibility can be both normal and inverse, is found out.

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Qualitative and Quantitative Analysis of Plastics, Polymers and Rubbers by Vibrational Spectroscopy

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1 INTRODUCTION

Infrared (IR) spectroscopy has a long tradition and remains one of the most widely used spectroscopic techniques in the analysis and characterization of organic polymers, plastics[a] and rubbers, and their products. While Raman spectroscopy using visible lasers has also been used for many years to study polymers, severe interference because of fluorescence frustrated many of the early applications to industrial polymers. This bugbear has now been largely circumvented through the use of various long wavelength (>700 nm) laser-excited dispersive Raman, and near-infrared (NIR) laser-excited Fourier transform (FT)-Raman, instrumentation. Additionally, modern polymers are often "cleaner", with lower impurities (e.g., catalyst residues) of the type that used to cause strong fluorescence a few decades ago. Consequently, the full potential of Raman and its sampling advantages are now being mostly realized in the analysis, study, and characterization of polymers and rubbers. IR and Raman spectroscopy are used both to identify materials and to probe the molecular microstructure and morphology of complex macromolecules and articles fabricated from them. There are many reviews and books on the subjects of polymer research and characterization by vibrational spectroscopy. They cover vibrational spectroscopy fundamentals through to experimental practice.[1–14]

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1 Studying the Viscoelastic Behavior of Liquid Crystalline Polyurethanes Using Static and Dynamic FT-IR Spectroscopy

Vasilis G. Gregoriou, Sheila E. Rodman, Bindu R. Nair, and Paula T. Hammond

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