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24 September 2018

Rosli Hussin

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BEFORE 6 BEERS



AFTER 6 BEERS

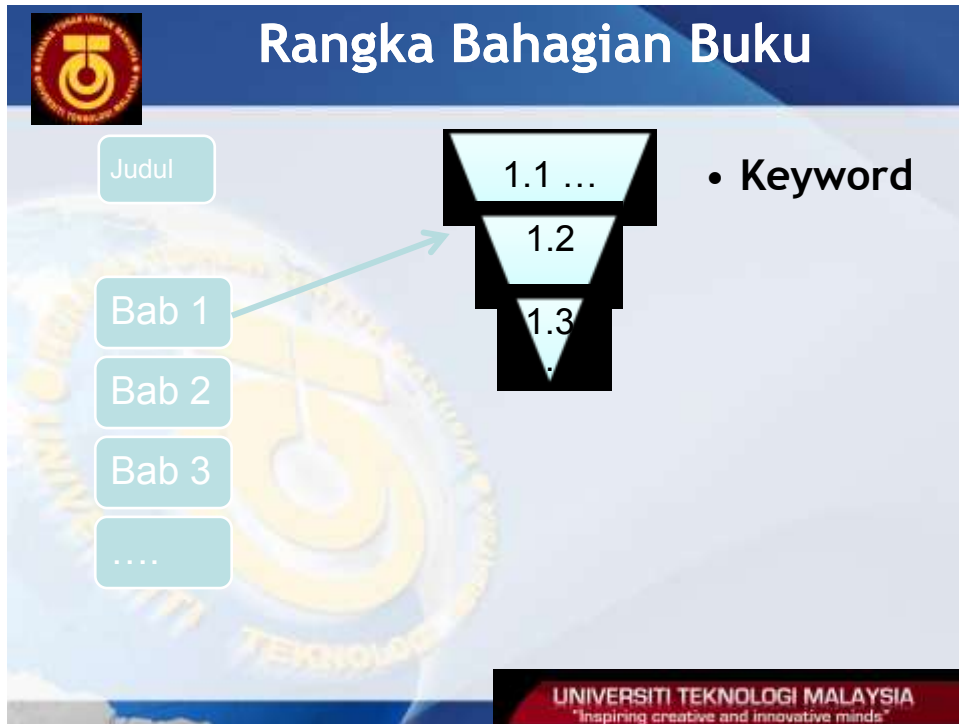
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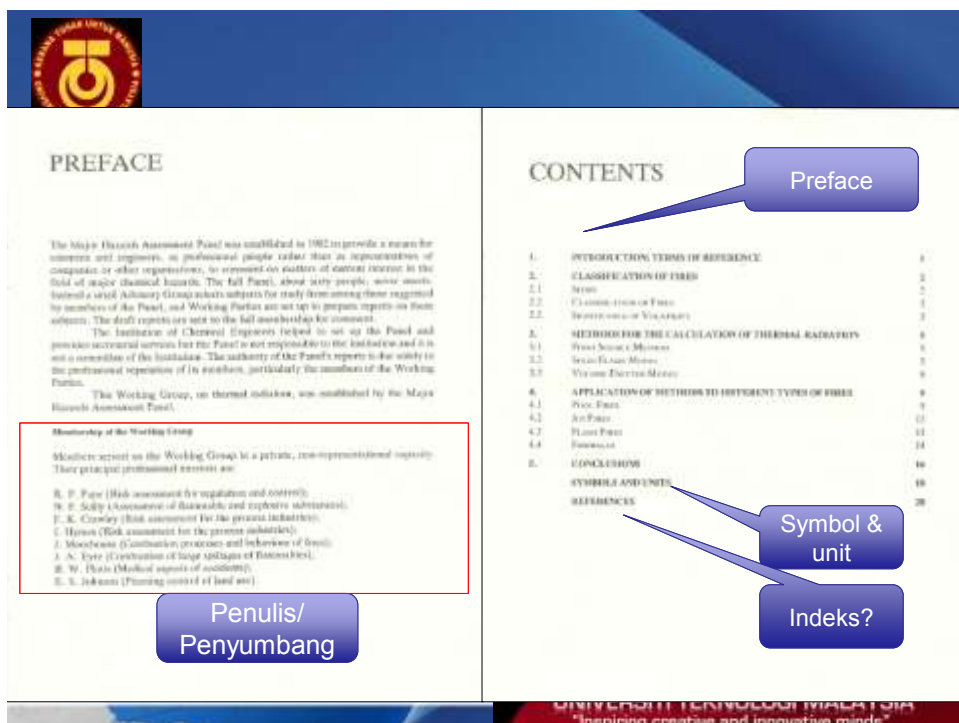
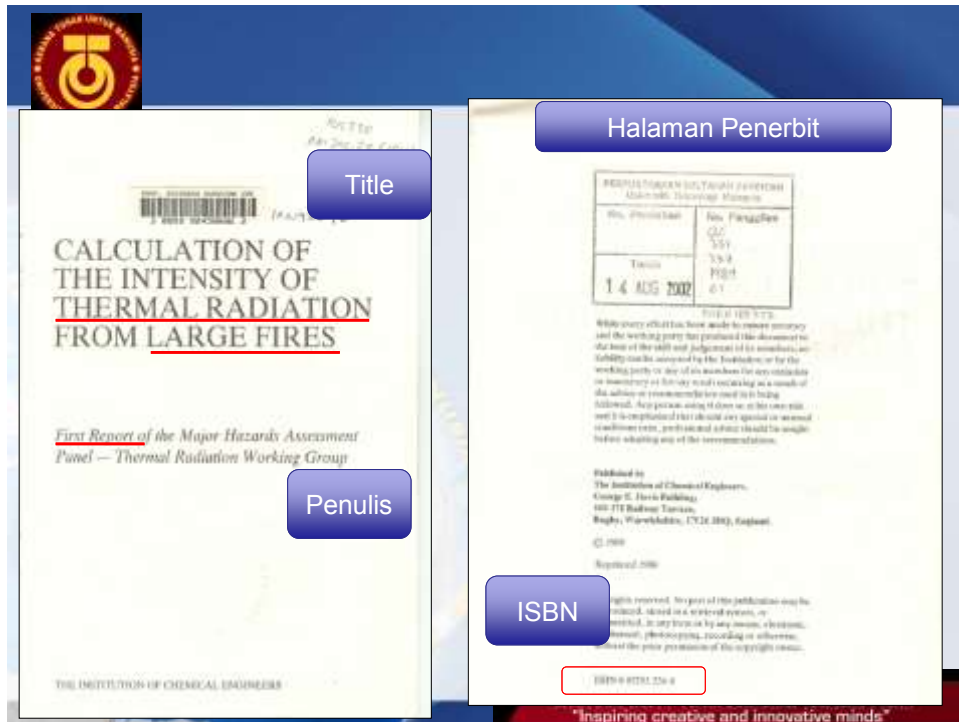
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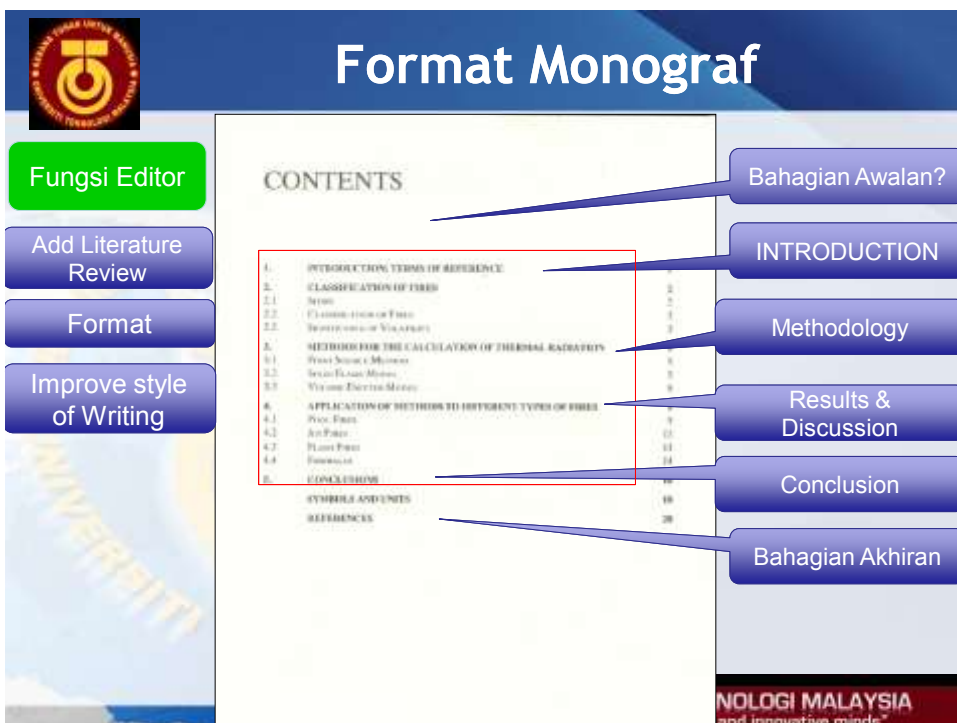
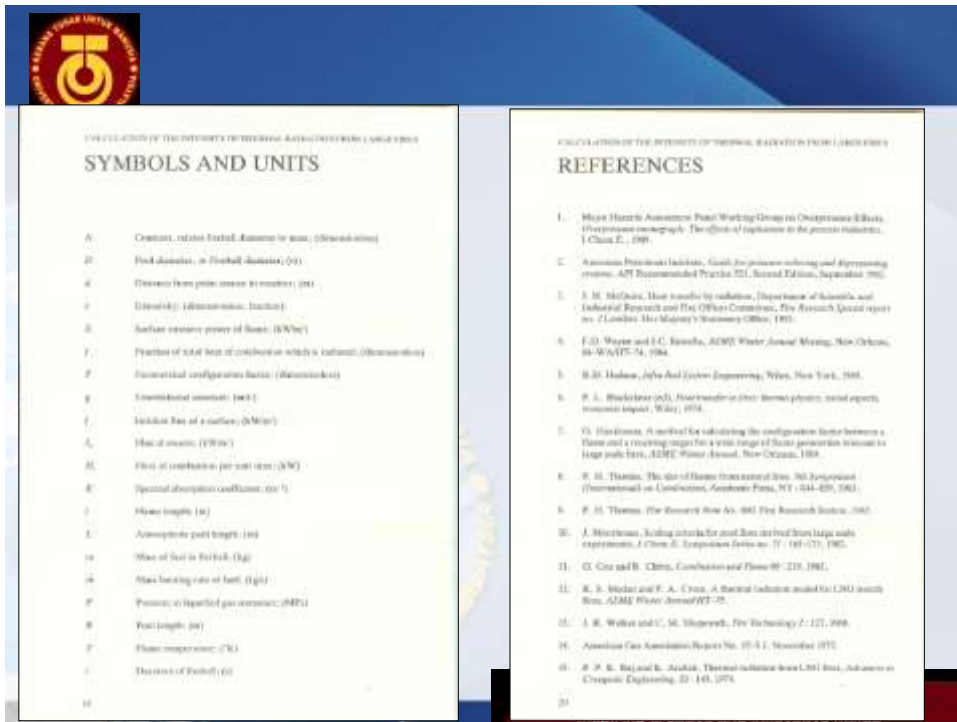


Merancang Manuskrip

- Kenapa Perlu Penulisan Buku???
- Menulis Buku yang Baik?
- Tujuan Penulisan?
- Sasaran Pengguna/ Pembaca
- Skop Penulisan
- Semak Judul
- Draf Content









1. INTRODUCTION

Prakata

This is the first report of the Working Group on Thermal Radiation of the Major Hazards Assessment Panel.

The terms of reference are:

intro

"to consider what levels of thermal radiation (from continuous fires, flash-fires and BLEVE's) would be significant in an emergency at places to which the public have access, taking the probability of the emergency into account, and how the radiation levels should be calculated."

The Working Group will report in three stages as follows:

- A description of various types of fire and methods for the calculation of the intensity and duration of thermal radiation in relation to the distance from the fire,
- The relationship between the amounts of thermal radiation received by people and the consequent injury levels including the risk of death.
- Factors influencing the choice of thermal radiation dose thresholds for the purposes of: emergency planning, control of public access and siting of installations.

objective

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2. TYPES OF FIRE

2.1 SCOPE

This paper is mainly concerned with fires which have the capacity to cause injury by the radiation of intense heat beyond the immediate flame boundary. Methods are described which may be used to calculate the intensity of thermal radiation at a given position in relation to a particular type and size of fire. For the purpose of this paper, no judgement is made about the probability of any particular fire situation. The paper begins with general statements on calculation methods, then it describes their application to different types of fire.

Fires may involve solids (eg. wood piles, buildings etc); liquids (eg. oil, petrol, kerosene etc) or gases (eg. natural gas, propane gas etc). In general the volatility of the fuel is one of the key parameters which determine the severity and speed of development of the fire (see Section 2.3).

Fires involving solids can, under some circumstances, present a significant hazard from thermal radiation outside the confines of the fire. However, such fires are usually relatively slow to build up, their growth varying time; and the output of radiant heat is moderate, so that the range of the thermal radiation hazard is limited. Consequently, solid fires are not considered to constitute "Major Hazards" in the present context and are not included in this report. (Note: certain solids which are used as propellants for military applications are exceptionally fast burning and these constitute special cases which are not covered here. Also, events such as the Bradford City Football Club fire show that burning times may be short if a solid fire can spread over a wide area.)

The most severe types of fires are those involving highly flammable and highly volatile substances such as LNG, LPG or gases under pressure. Other flammable liquids may, however, give similar hazards if their volatility is increased by them being at elevated temperatures.

Any explosion effects associated with fires are not dealt with in this report. A companion paper on such effects has recently been published.

2.2 CLASSIFICATION OF FIRES

Release of liquid or gases from containment can give rise to a number of types of fires. These may be classified as pool fires, jet fires, flash fires, fireballs and firestorms.

1. POOL FIRE

A pool fire occurs when an accumulation of liquid in a pool on the ground or in water is ignited. A steadily burning fire is rapidly achieved since the fuel vapour required to sustain the flames is provided by evaporation of the liquid by the heat from the flames. For liquid fuel significant heat transfer from the surface on which the pool is

formed also contributes to the vaporisation of the fuel. The rate of consumption of fuel is dependent upon properties of fuel such as latent heat, and is equivalent to a pool depth regression in the range 6 to 15 mm/minute. The flames from pool fires behave entirely under the influence of their own buoyancy and are easily displaced by the wind.

2. JET FIRE

A jet fire occurs when a flammable liquid or gas is released from a penetrator or pipe into free air. The pressure of the release serves to generate a long flame which is stable under most conditions. Jet flames are largely unaffected by the wind. The duration of the fire is independent of the fire characteristics but is dependent on the release rate and volume of the source. For a liquid or a two phase jet a part of the liquid may "rain-out" of the jet giving rise to a pool fire.

3. FLASH FIRE

A flash fire occurs when a cloud of flammable gas in a mixture with air is ignited. The shape of the fire is dependent upon the shape of the flammable cloud and the position of the ignition source. The fire is usually of short duration as the flame travels rapidly through the cloud. The velocity of the flame, which is usually a few metres per second, is dependent upon the gas concentration in the cloud and on the wind speed. Flash fires often serve as a way by which a remote source of ignition can lead to a jet or pool fire at the point of release. In certain circumstances it is possible for a flame to accelerate to a very high velocity, thus producing explosion effects. This aspect is outside the scope of this document.

4. FIREBALL

A fireball occurs when a quantity of flammable liquid or gas is suddenly released and is immediately ignited. The fuel is rapidly burnt as a spherical fireball which rises due to the initial momentum of the release and the high buoyancy of the hot flames. The initial fuel mass determines the fireball size and duration, and large fireballs are little affected by the wind.

Fireballs are known to arise following a BLEVE (boiling liquid expanding vapour explosion) in which fire induces heating and the subsequent failure of a pressurised storage vessel.

5. FIRESTORMS

In certain conditions, fire covering a very large area can produce a firestorm effect by inducing convection-driven winds which bring back the fire and propagate it by carrying sparks. There may also be significant damage and propagation by thermal radiation in such conditions. The scale of the phenomenon seems to exceed that of most installations, so it is not discussed further here.

2.3 THE SIGNIFICANCE OF VOLATILITY

The magnitude of the thermal radiation effect depends on the rate and mass of gas or vapour released or produced by vaporisation of a liquid spill. For a liquid, volatility is a key factor in determining the type of fire, its

Chap 2

significance



Strategi merombak

Langkah pertama

Fikirkan kemungkinan **bentuk, terma dan konsep** buku yg bakal terbit. Apakah sebuah **buku ilmiah, book chapter** atau **monograf**

Langkah kedua

- fikirkan sebuah **judul** baru bagi buku yang bakal diterbitkan

Langkah ketiga

- fikirkan **struktur baru** buku, judul bab yang baru, penambahan bab jika perlu, sub judul dlm tiap bab

Langkah keempat

Pindahkan bahan dalam tesis ke dlm bab-bab yg baru

Langkah kelima

Sunting setiap bab, sunting ilustrasi, tambah gambar jika perlu

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ME SAID - MONG SAID ABDULLAH
MAIL CHAIR



PEMBANGUNAN TANAH HALANGANNYA

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Vol. 122, Pt. 1, March 2004 This issue contains information regarding benefits from the new Social Security provisions. Vol. 122, Pt. 1, pp. 1-12. **Vol. 122, Pt. 2, April 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 2, pp. 1-12. **Vol. 122, Pt. 3, May 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 3, pp. 1-12. **Vol. 122, Pt. 4, June 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 4, pp. 1-12. **Vol. 122, Pt. 5, July 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 5, pp. 1-12. **Vol. 122, Pt. 6, August 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 6, pp. 1-12. **Vol. 122, Pt. 7, September 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 7, pp. 1-12. **Vol. 122, Pt. 8, October 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 8, pp. 1-12. **Vol. 122, Pt. 9, November 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 9, pp. 1-12. **Vol. 122, Pt. 10, December 2004** This issue contains information regarding the new 2004-2005 TRICARE rules. Vol. 122, Pt. 10, pp. 1-12.

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Memandang pendirian tentang pembangunan tanah dalam hukum Melike tanah kutang, maka karya ini disiapkan untuk menambah khazanah pemikiran berkaitan dengan memberikan pendidikan kepada pemuka tentang pembangunan tanah khususnya faktor yang menghalang pembangunan tanah. Oleh itu, pendirian ini mempunyai nilai, minat, dan faedah luas dan dalam yang mempengaruhi pembangunan tanah aspek yang berikut:

Bab 1 menjelaskan definisi pembangunan tanah secara umum dan juga menguraikan aspek penting yang menjadi halangan kepada pembangunan tanah. Dalam bab ini, takrif pembangunan tanah akan diperkenalkan. Pembangunan tanah melibatkan proses yang rumit dan perlu dilakukan sebagai satu perancangan. Pembangunan dianggap penting, bekalan manusia yang mudah dijangkau. Terdapat pelbagai agen dan agensi atau 'pemakai' yang memetakan peranan masing-masing dalam pembangunan tanah.

Bab 2 menguraikan secara lebih rinci secara umum yang mempengaruhi pembangunan, yaitu: Salah satu aspek penting dalam pembangunan tanah ialah Dasar Pembangunan Nasional yang diberikan sebagai kerangka untuk menjadikan negara khususnya melalui pembangunan tanah. Dasar pembangunan ini menjadi panduan dalam cara membangun tanah sebagai sumber penghidupan dan kesejahteraan masyarakat yang lebih baik.

Dalam Bab 3 juga, penulisan ini menjelaskan langkah-langkah yang menjadi proses yang harus diikuti dalam pembangunan tanah. Berikut juga dengan jenis pembangunan tanah dan pihak yang terlibat dalam pembangunan tanah.

Buku 4 mengungkap isi yang terdapat dan faktor yang boleh mengahang usaha pembangunan tanah. Faktor dalam memampukan kita dapat perolehi tanah dan ghaib yang berkesinambungan, manakala faktor luar pula merupakan faktor selain daripada perolehi yang mengahang pembangunan tanah termasuklah faktor penerangan dan pemilikan tanah.

444 B. Pothmann

Bagi mempunyai faktor keutan dan dalam yang menghambat pemerintahan, baik keajaip diabaikan dalam Bab 1 yang mempunyai keajaip dan di Puluu Dukung, Kania Sintang. Dalam bab ini, beberapa pendidik, ahli pendidikan dan pendidik sebagai diabaikan. Pendidik telah menjadikan faktor baik baik dan beberapa sebagai halangan utama sebagai pemerintahan. Pendidik telah menghambat pemerintahan dan ada ada menghambat pemerintahan karena sebagai beberapa pemerintahan telah baik baik.

Pendidikan ini ditujukan khusus kepada pelajar di Australia dengan tinggi seratus seribu yang mengambungkan jurusan dalam kimia, perikanan, bangunan, seni bina, sains tanah, atau dalam pendidikan litar, perancangan dan pembangunan tanah, perancangan bandar, perikanan dan sebagainya. Selain itu, perkhidmatan juga akan menyediakan bina bi bersejarah untuk memperkukuhkan pengetahuan dalam bidang pembangunan tanah.

Aliran ukrai, kalangan pembaca terutama mereka yang terbelas di era pertengahan abad adalah di dalam dunia yang mengalami krisis peredaran (ii).

Md. Said @ Mohd. Zaid Abdullah
Strat Survey Consultants Sdn. Bhd.
Kuala Lumpur

Ismail Omar
Fakulti Geoinformasi & Harta Tanah
Universiti Teknologi Malaysia
2012

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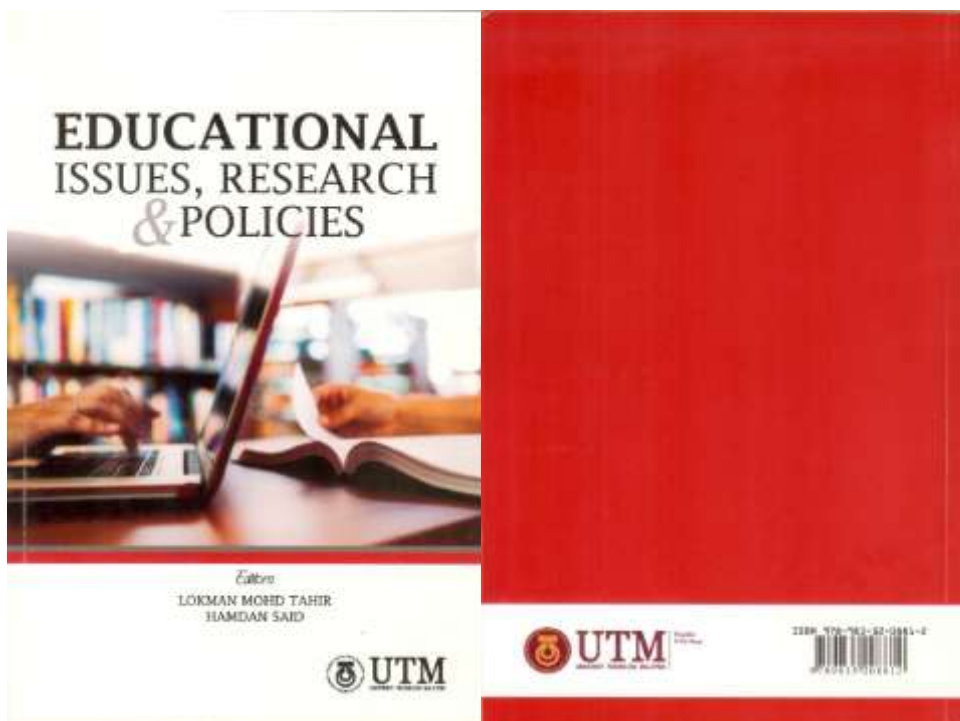
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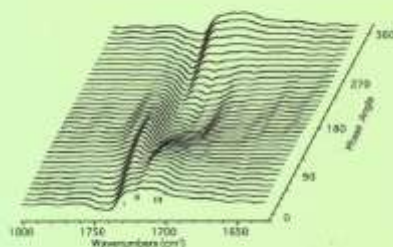
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						<p>This is a book about both service and employee management (HRM) Management and Leadership.</p> <p>Its purpose is to disciplinary issues in management. This book elements of people and management.</p> <p>There are four chapters in employee management workplace. Three chapters are followed by building knowledge sharing in book relate to management performance.</p> <p>This book is designed from full understanding business and people development.</p> <p>The editors would everyone that has contributed. We hope you welcome any comments.</p> <p>Royce Anvari Nur Nahn Abu Man Faculty of Management Universiti Teknologi 2014</p>	<p>1</p> <p>HUMAN RESOURCE STRATEGIES AND EMPLOYEE RETENTION</p> <p>Rahmat Husein Abdul Rahman</p> <p>1.1 INTRODUCTION</p> <p>Excessive external labour mobility – overseas, to Singapore, and intra-firm – by knowledge workers, particularly engineers, is thought to be hampering Malaysia's drive for knowledge economy status. The rate of emigration of Malaysian highly skilled labour is considered high in comparison to that of other countries. In 2010, net labour migration of tertiary-educated workers was 11.1% from Malaysia, compared with 2.7% from Australia, 2.1% from Indonesia, and only 1.2% from Japan (Karapathis, 2008; Ratha et al., 2011). There is a second, specifically Malaysian issue of cross-border mobility, that between the Malaysian state of Johor and Singapore. Many highly skilled Malaysian workers either move or commute to Singapore which is geographically adjacent to Johor state. It was estimated in 2001 that almost 20 000 Malaysians in professional or technical jobs as well as semi-skilled and unskilled jobs were commuting to and from Singapore daily (OECD, 2001). This issue suggests a challenge particularly for employers in Johor in attracting and retaining especially the skilled employees in the local labour market. There is a third issue of potential skill wastage</p>
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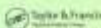
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Vibrational Spectroscopy of Biological and Polymeric Materials



edited by
Vasilis G. Gregoriou
Mark S. Braiman



Overview

Ideal primarily for characterizing polymers and biological systems, vibrational spectroscopy continues to advance practical vibrational polymer and biological systems applications. *Vibrational Spectroscopy of Biological and Polymeric Materials* describes the latest developments in advanced infrared and Raman spectroscopy techniques that are applicable to both polymeric materials and biological systems. It also presents instrumentation and experimental details that can be used by polymer chemists and biologists in the design of their own experiments.

The book discusses static and dynamic FTIR spectroscopy 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 role 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, Raman optical activity, the use of ligand-gated FTIR difference spectroscopy in neuropharmacology, and the application of time-resolved FTIR spectroscopy to biological systems.

Features

- Describes methods that take advantage of recently available mid-IR multifunctional 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 spectroscopic mid-IR multifunctional detectors combined with interferometers
- Provides a detailed guide to the use of commercial step-scan instrumentation for acquiring submillisecond mechanistic details of photochemical processes

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

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Preface

Infrared spectroscopy was discussed by William Herschel in the early 18th century, with the discovery of the Raman effect to follow about a century later. Both scientists have enjoyed their age and down, a field that is always associated with specific technical advancements in their subsequent. Nowadays, thousands of researchers in both academic and industrial laboratories are used primarily for characterizing polymers and biological systems and the number of applications continues to grow exponentially.

In this book, we have selected reports in the field to address selected areas of broad interest in an effort to provide the latest developments in the application of advanced infrared and Raman techniques to the above-mentioned materials. We also wanted to give enough experimental detail, and not just to document recent technological advances, so that experimental vibrational spectroscopists might be able to design and execute their own experiments similar to the ones described in this book. Additionally, we wished to examine methods that are particularly accessible to cross-fertilization between the related fields of polymer chemistry and biochemistry. These two fields tend to have distinct groups of practitioners, each of which is likely to benefit from seeing what is developing in the other group. This book should be a useful addition to the number of volumes on infrared and Raman spectroscopy that have appeared in the last few years, such as *Infrared and Raman Spectroscopy of Biological Materials* by Upreti and Van der Vliet (Decker), *Handbook of Vibrational Spectroscopy* by Griffiths and Challa (Wiley), and *Modern Infrared Spectroscopy* by Challa, Challa, and Challa (Elsevier).

The book consists of eight chapters. In Chapter 1, Gregoriou et al. discuss the use of static and dynamic FTIR spectroscopy as an emerging class of polymer, liquid crystalline polyurethanes. As in-depth analysis of the issues behind both static and dynamic linear dichroism measurements, as they are also called, is presented in this chapter with the individual responses of the different parts of the polymers clearly mentioned. The following chapter by Gidycz et al. deals with the successful utilization of Raman spectroscopy in the measurement of stress in solids in both single and multiple fiber composite materials. As in-depth analysis of the use of this cyclic carbon for various measurements as well as the use of conventional Raman methods are described in this chapter. The chapter by Hasegawa and Lohmeyer describes the use of "classical" spectroscopy to study structural materials, both biological and polymeric. Using the Langmuir-Blodgett technique, the authors were able to prepare high-quality ultrathin membranes. The principles of transmission and reflection measurements (the latter on both metals and dielectric substrates) are very well documented, and the chapter provides a comprehensive survey of the application of these tests to a wide variety of thin films. The fourth contribution by Challa and Baer gives an even more depth in describing the principles of two-dimensional (2D) correlation spectroscopy, with an analysis of the most theoretical

progress in the field. In particular, the techniques of single-matrix and multivariate 2D correlation spectroscopy are described, along with an array of applications to both polymeric materials (nylon 12, linear low-density polyethylene, polyethylene-2,6-naphthalene, polydimethylsiloxane) and biological compounds (membrane fluidity, oval albumin film, haemoglobin).

For the chapters on biological materials in particular, we wished that no review of published works would likely concern with the value of the field. For example, a search on the topic "FTIR" in PubMed yields over 5000 articles, including over 100 reviews, between 2000 and 2005. Therefore the authors were encouraged to focus their chapters on practical experimental considerations within their own areas of expertise. Especially in new fields, such considerations are often hard to glean from original research articles or monographs, especially from commercial manufacturers. In Chapter 5, Burges, Schaefer, and Levin describe advances in nanoscale imaging techniques that utilize molecular vibrational spectroscopy. They emphasize methods that take advantage of the recent availability of mid-IR confocal detectors. When combined with interferometers, these allow simultaneous collection of two-dimensional spectra from a large number of independent points, and open new windows of contrast within nanoscale time samples, without the requirement for external dyes or labels. In Chapter 6, Kisker, Kisker, and Kisker describe advances in vibrational circular dichroism of proteins and nucleic acids. Their work is aimed mainly towards structural analysis of large polymers that are often not amenable to high-resolution X-ray diffraction. This application depends on recent developments of modeling methods, utilizing both small molecules and computations, that are described with great care. In Chapter 7, Hasegawa, Ryan, and Sato describe the use of ligand-gated FTIR difference spectroscopy and in particular its application in neuropharmacology. This contribution is likely to appeal to a broader variety of pharmacologists who are trying to identify ligands, and modes of ligand action, for the large number of membrane receptors recently identified in the human genome. Finally, in the closing chapter, Braiman and Nuss discuss the application of time-resolved FTIR spectroscopy to biological materials. The main focus is on the use of commercial step-scan instrumentation for examining the molecular mechanisms of photoreceptor proteins that utilize isomerizable chromophores (rhodopsin, bacteriorhodopsin, etc.) in the cytoplasm, chromophore-bound photoreceptor proteins, and photoreceptor proteins. However, recent advances in step-scan time-resolved FTIR to samples that are driven by other triggers, such as temperature jumps and photochemical release of caged ligands, are likely to be of expanding interest, not only to biologists but also to polymer chemists.

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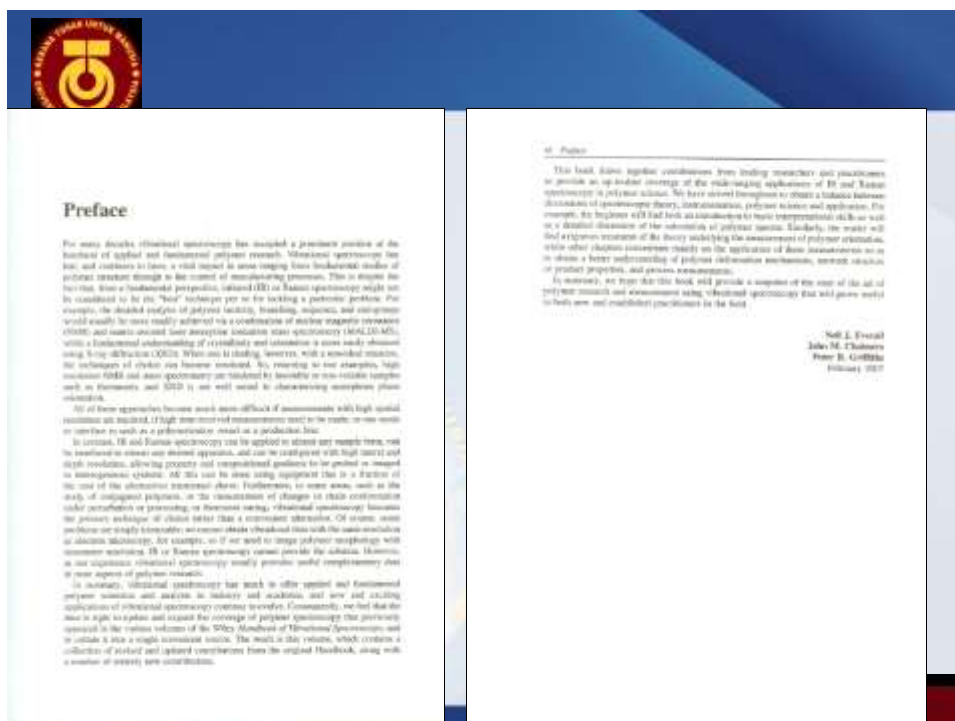
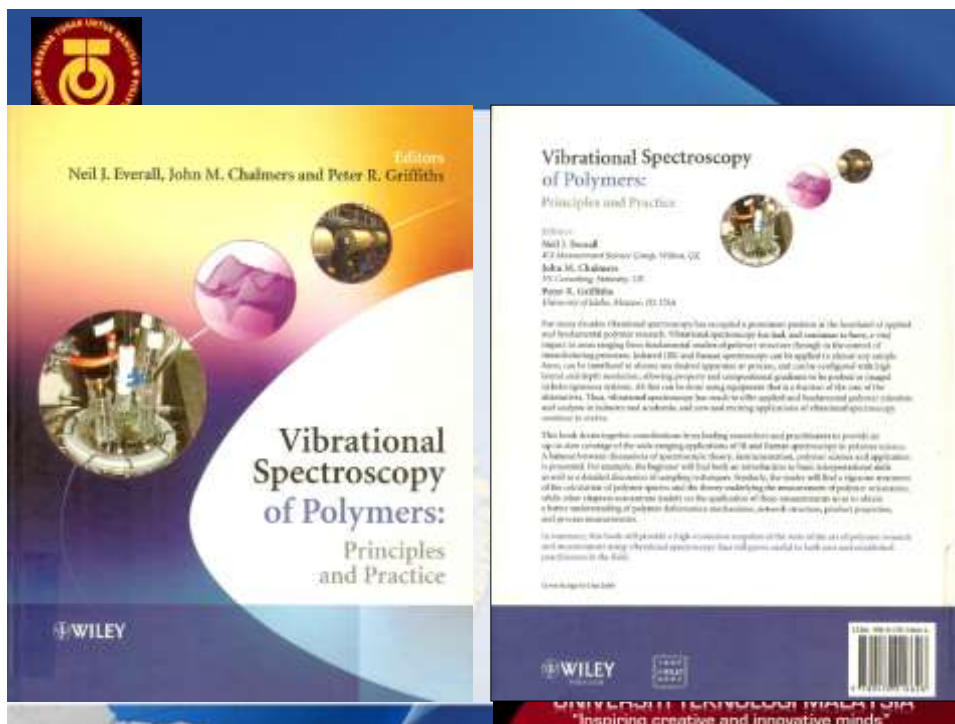
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<p>Characterization of Biomaterials</p> <p>Edited by Amit Bandyopadhyay Susmita Bose</p>	<p>Characterization of Biomaterials</p> <p>One of the key strategic current biomaterials researches, how to identify which of the currently available highly specialized characterization tools can be profitably applied to different materials and biomedical devices. This book is a comprehensive guide to the characterization of biomaterials and biomedical devices, covering the physical, chemical, mechanical, electrical, optical, and biological characterization tools and techniques of increasing importance in biomaterials research.</p> <p>Characterization of Biomaterials is a critical and comprehensive overview of the physical, chemical, mechanical, electrical, optical, and biological characterization tools and techniques of increasing importance in biomaterials research.</p> <p>KEY FEATURES</p> <ul style="list-style-type: none"> • The book contains a critical review of the physical, chemical, mechanical, electrical, optical, and biological characterization tools and techniques of increasing importance in biomaterials research. • Detailed discussion of important test methods for biomaterials by providing specific test methods and standards for applied characterization. • Detailed discussion on both biomaterials and devices of these characterization tools and techniques to follow the regulatory processes. • Special emphasis on the physical and mechanical properties. <p>Characterization of Biomaterials will serve as a comprehensive resource for biomaterials researchers, engineers, and scientists in the field of biomaterials, biomedical devices, and biomedical research. The book is designed for materials scientists, biologists, chemists, and biomedical device researchers working in the field of biomaterials and biomedical devices, and for students and researchers in the field of biomaterials and biomedical devices.</p> <p>About the editors:</p> <p>Amit Bandyopadhyay is a professor of Mechanical and Materials Engineering at Rochester Institute of Technology (RIT), USA. He has authored over 200 technical papers and books on biomaterials, a Fellow of the American Ceramic Society, American Society for Biomaterials, the American Society for Medical and Biological Engineering (ASMBE), and the ASME.</p> <p>Susmita Bose is a professor of Mechanical and Materials Engineering at RIT, USA. She has received the NSF-PERCASE award (PCE) award from the American Ceramic Society, awarded a "Rising Star" award of the National Association of Biomedical Engineers (NABE), and is an editorial board member of the <i>International Journal of Biomaterials</i>. She has authored over 200 technical papers.</p>
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Preface List of Contributors	3.0. Endorsement	Y.M. Thirumangalakudi, Director of Biomaterial Technology, Biomedical Technology Wing, Anna University, Chennai, India	
	3.6. Data Acquisition and Acknowledgements	Hendry Wang, Department of Physics and Materials Science, City University of Hong Kong, Kowloon, Hong Kong, China	
	References	John W.B. Institute of Biomaterials, University of Erlangen-Nuremberg, Erlangen, Germany	
	4. Surface Characterization	Mag H. Wu, Edwards Lifesciences LLC, One Edwards Way Irvine, CA, USA	
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	5.1.2. History	Hendry Wang, Department of Physics and Materials Science, City University of Hong Kong, Kowloon, Hong Kong, China	
	5.1.3. Scope	John W.B. Institute of Biomaterials, University of Erlangen-Nuremberg, Erlangen, Germany	
	5.1.4. Objectives	Mag H. Wu, Edwards Lifesciences LLC, One Edwards Way Irvine, CA, USA	
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	5.2.2. Quantification of Cardiovascular Implants	Hendry Wang, Department of Physics and Materials Science, City University of Hong Kong, Kowloon, Hong Kong, China	
	References	John W.B. Institute of Biomaterials, University of Erlangen-Nuremberg, Erlangen, Germany	
		Mag H. Wu, Edwards Lifesciences LLC, One Edwards Way Irvine, CA, USA	
3. Atomic Force Microscopy	7.1. Structural and Biomechanical Properties	Y.M. Thirumangalakudi, Director of Biomaterial Technology, Biomedical Technology Wing, Anna University, Chennai, India	
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	7.1.2. Characterization of Cardiovascular Implants	Hendry Wang, Department of Physics and Materials Science, City University of Hong Kong, Kowloon, Hong Kong, China	
	7.1.3. Porosity	John W.B. Institute of Biomaterials, University of Erlangen-Nuremberg, Erlangen, Germany	
	7.1.4. Permeability	Mag H. Wu, Edwards Lifesciences LLC, One Edwards Way Irvine, CA, USA	
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Preface

For many decades vibrational spectroscopy has occupied a prominent position at the heart of applied and fundamental polymer research. Vibrational spectroscopy has long and continues to have a vital impact in areas ranging from fundamental studies of polymer structure through to the control of manufacturing processes. This is despite the fact that, from a fundamental perspective, infrared (IR) and Raman spectroscopy might not be considered to be the "best" techniques yet to be lacking a particular problem. For example, the detailed analysis of polymer flexibility, branching, sequence, and conformation would usually be more readily achieved via a combination of nuclear magnetic resonance (NMR) and mass spectrometry than descriptive vibrational spectroscopy (MALDI-MS), while a fundamental understanding of crystallinity and conformation is more readily obtained using X-ray diffraction (XRD). When one is dealing, however, with a complex mixture, the techniques of choice are become restricted. So, regarding to test examples, high-resolution NMR and mass spectrometry are hindered by low solubility or non-volatile samples such as polymers and XRD is not well suited to characterising amorphous phase materials.

All of these approaches become much more difficult if measurements with high spatial resolution are required. If high time-resolved measurements need to be made, or one needs to measure in situ as a pre-requisite, or even as a production line.

In contrast, IR and Raman spectroscopy can be applied to almost any sample form, can be performed in almost any desired apparatus, and can be combined with high spatial and high resolution, allowing property and compositional gradients to be probed or mapped in heterogeneous systems. All this can be done using equipment that is a fraction of the cost of the alternative structural characterization techniques, or even more, such as the costly of synchrotron radiation. Furthermore, in some cases, such as the study of conjugated polymers, or the characterisation of changes in their conformation under perturbation or processing, or thermal curing, vibrational spectroscopy has the primary advantage of being faster than a conventional alternative. Of course, some authors are rightly concerned, or even alarmed, about the use of the same technique as vibrational spectroscopy, for example, so if we need to image polymer morphology with nanometer resolution, IR or Raman spectroscopy cannot provide the solution. However, as our experience vibrational spectroscopy readily provides useful complementary data in most aspects of polymer research.

In summary, vibrational spectroscopy has much to offer applied and fundamental polymer research and analysis in industry and academia and new and exciting applications of vibrational spectroscopy continue to emerge. Consequently, we feel that this book is right to explore and expand the coverage of polymer spectroscopy that previously appeared in the various volumes of the Wiley Handbook of Vibrational Spectroscopy and to include it into a single monograph volume. The result is this volume, which contains a collection of worked and updated contributions from the original Handbook, along with a number of newly new contributions.

Vibrational Spectroscopy of Polymers: Principles and Practice

Editors:

Neil J. Everall

K2 Measurement Science Group, Milton, UK

John M. Chalmers

DS Consulting, January, UK

Peter R. Griffiths

University of Idaho, Moscow, ID, USA

For many decades vibrational spectroscopy has occupied a prominent position at the heart of applied and fundamental polymer research. Vibrational spectroscopy has long 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 performed in almost any desired apparatus, and can be combined with high spatial and high resolution, allowing property and compositional gradients to be probed or mapped in heterogeneous systems. All this can be done using equipment that is a fraction of the cost of the alternative. Thus, vibrational spectroscopy has much to offer applied and fundamental polymer research and analysis in industry and academia and new and exciting applications of vibrational spectroscopy continue to emerge.

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 to polymer science. A balance between theoretical and spectroscopic theory, instrumentation, polymer science and application is presented. For example, the chapters will find both an introduction to basic fundamental data as well as a detailed discussion of sampling techniques. Similarly, the reader will find a rigorous treatment of the calibration of polymer spectra and the theory underlying the measurement of polymer structure, while other chapters concentrate purely on the application of these measurements to a variety of other polymer research areas such as the application of these measurements to a variety of other polymer research areas such as the application of these measurements to a variety of other polymer research areas.

In summary, we hope that this book will provide a complete overview of the state of the art of polymer research and measurements using vibrational spectroscopy that will provide useful and established procedures for the field.

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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 to polymer science. A balance between theoretical and spectroscopic theory, instrumentation, polymer science and application is presented. For example, the chapters will find both an introduction to basic fundamental data as well as a detailed discussion of the calibration of polymer spectra. Similarly, the reader will find a rigorous treatment of the theory underlying the measurement of polymer structure, while other chapters concentrate purely on the application of these measurements to a variety of other polymer research areas such as the application of these measurements to a variety of other polymer research areas.

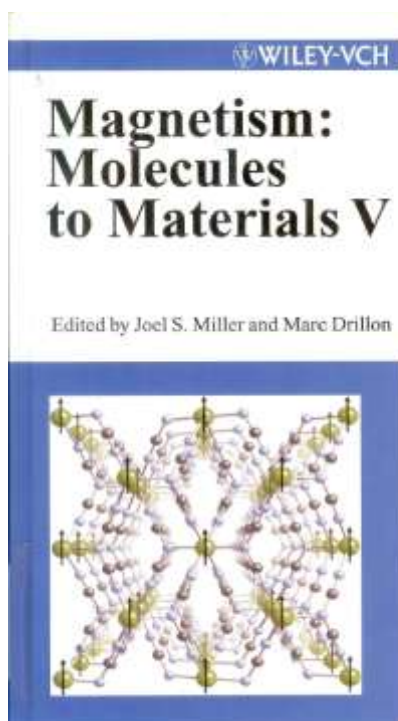
In summary, we hope that this book will provide a complete overview of the state of the art of polymer research and measurements using vibrational spectroscopy that will provide useful and established procedures for the field.

Neil J. Everall
John M. Chalmers
Peter R. Griffiths
January 2017

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Contributors	
<p>Georgia A. Arachio-Rail <i>Polymers, The State University of New Jersey, Camden, NJ, USA</i></p> <p>P. James Bunn <i>University of Cambridge, Cambridge, UK, USA</i></p> <p>Isoloma Aguilera <i>Laboratoire PPA20, CNRS, Paris, France</i></p> <p>Thierry Buffenue <i>Université de Bordeaux I, Talence, France</i></p> <p>Chien-Georg Hsieh <i>Polymers, The State University of New Jersey, Camden, NJ, USA</i></p> <p>John M. Chalmers <i>3M Consulting, Sydney, NSW, Australia</i></p> <p>Brian Chao <i>DuPont Experimental Station, Wilmington, DE, USA</i></p> <p>A.B. Chalmers <i>University of Denver, Denver, CO, USA</i></p> <p>Russell C. Cole <i>ARC Industrial Materials Institute, Roskilde, Denmark</i></p> <p>Neil J. Brewell <i>ICI Measurements, Wilton, UK</i></p> <p>Przemysław P. Frutkiewicz <i>University of Technology, Brisbane, Australia</i></p> <p>Yoshihiro Furukawa <i>Waseda University, Tokyo, Japan</i></p>	<p>Peter R. Griffiths <i>University of Idaho, Moscow, ID, USA</i></p> <p>G.G. Hoffmann <i>University of Duisburg-Essen, Essen, Germany</i></p> <p>Richard Hsieh <i>University of Delaware, Newark, DE, USA</i></p> <p>Jack L. Koenig <i>Case Western Reserve University, Cleveland, OH, USA</i></p> <p>G. Kotowski <i>University of Duisburg-Essen, Essen, Germany</i></p> <p>F. Pagliaro <i>Université d'Aix-Marseille I, Marseille, France</i></p> <p>R. P. James Bunn <i>University of Cambridge, Cambridge, UK, USA</i></p> <p>Michel Péroche <i>Université de Bordeaux I, Talence, France</i></p> <p>F. Péroche <i>University of Duisburg-Essen, Essen, Germany</i></p> <p>R.M. Smith <i>University of Denver, Denver, CO, USA</i></p> <p>Koji Tashiro <i>Waseda University, Tokyo, Japan</i></p>

<p>Chapter 1</p> <p>Magnetoelectrical Magnetism (Review)</p> <p>M.J. Bichurin Institute of Materials 170021 Tokyo, Japan Mikhail.Bichurin@nsl.ru</p> <p>This chapter is magnetically and magnetoelectrically comparable with the applications of objectives in a different context relative to the 3-2 type context itself. In addition, it is also a way to process the ME parameters.</p> <p>Copyright © 2012 John Wiley & Sons, Ltd. www.interscience.wiley.com</p>	<p>multiferroic composites in situ investigations thin films electromechanical and thermoelastic properties piezoelectric properties piezoelectric structure frequency range, effects with efficient exchange piezoelectric and piezoelectric gain advantage by using</p> <p>Acknowledgments</p> <p>This work was supported by the Ministry of Science and Technology.</p> <p>References</p> <ol style="list-style-type: none"> 1. L.D. Landau, E.M. Lifshitz, <i>Electrodynamics of Continuous Media</i>, 2nd edn, Butterworths, London, 1960. 2. L.D. 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Preface

When light is weak, atoms and molecules absorbing it may not change their original characters. In optical spectroscopy, an optical transition occurs from one eigenstate to a higher lying eigenstate of atoms and molecules. From the spectrum, we can obtain a variety of characteristic features of atoms and molecules. On the other hand, when light becomes much stronger, atoms and molecules interacting with such intense light fields behave in drastically different ways from those in weak light fields.

Ultrafast and intense laser technologies have developed rapidly, and recent investigations of atoms and molecules in such ultrafast intense laser fields have revealed the existence of characteristic phenomena such as above-threshold ionization, dissociation ionization, stimulated Raman scattering, and electron transfer processes in molecules. Coherent explosion of molecules and clusters, and high-order harmonic and attosecond pulse generation. To better understand these phenomena, which carry rich information regarding light-matter interactions, we need to learn the fundamentals of nonlinear optical interactions, electronic structure in atoms and molecules, and advanced techniques in laser engineering.

The emerging research field of ultrafast intense laser science has an inherently interdisciplinary character, and the issues and phenomena being investigated may not be taught in standard physics, chemistry, or laser engineering courses. Therefore, in order to provide a standard basis for these newly emerging research fields, we held a school in which world-leading researchers in ultrafast intense laser science presented a series of lectures.

With the financial support of the 2008 Japan Society for the Promotion of Science Core-to-Core Program on Ultrafast Intense Laser Science, Japan Intense Light Field Science Society (JILFSS), All Japan Office of Scientific Research (AJOFFS), and Asian Office of Atmospheric Research and Development (AORD), we held the COAST-Asian School on Ultrafast Intense Laser Science at the University of Tokyo, Japan, during November 24–26, 2008.

At this school, a total of 10 lectures were given by 12 world-leading scientists, and a total of 32 young researchers from Canada, Germany, France, Italy, the United States, and Japan enjoyed the opportunity to learn about research topics at the forefront of ultrafast intense laser science.

Preface

On November 24, 2008, after the opening address by myself, Mr. Kaoru Hirayama (then Deputy Head, Research Cooperation Division B, International Program department, ISPS) and Mr. Nobuhiko Shimizu (then Head, International Affairs Division, The University of Tokyo), lectures were given by Prof. Farhad H.M. Faisal (Birkbeck University), Prof. Kazuhiko U. Nakamura (Tokyo Institute of Technology), Prof. Jeff Squit (Colorado School of Mines), and Prof. Hirotoshi Nakano (NIT). On the next day, Prof. Howard Rains (American University), Prof. Hirokazu Kono (Tohoku University), Prof. Pierre Agostini (Ohio State University), and Prof. Parvinder Kaur (Keio University) gave lectures. On the third day, Prof. Gintaro Furuta (Fukuoka University), Prof. Kazuo Miki (GRI), Prof. Ben-Liang Chen (Harvard University), and Prof. Lucinda Guo (CNRS) gave lectures.

The lectures covered a wide range of subjects in ultrafast intense laser science such as fundamentals of atomic and molecular dynamics in intense laser fields, experimental and theoretical approaches to controlling molecular behavior and chemical reaction in intense laser fields, high-order harmonic generation, filamentation processes, quantum resonance and X-ray emission from a solid target by the irradiation of intense laser light, and laser-matter interaction in the ultra-intense regime.

Since the lectures were so well prepared, and the attendees evaluated the lectures as very exciting and informative, we thought it appropriate to record the topics expanded on in the Autumn School in the form of a book for the benefit of researchers and graduate students in a variety of research fields.

In order to convey the excitement of the school, we arranged the chapters so that the readers could feel as if they were attending the lectures in the lecture room. Indeed, the chapters of this book are based on manuscripts of the actual lectures. I greatly appreciate the effort and cooperation made by the invited lecturers to send their manuscript manuscripts into the current form. I would also like to thank Mr. Chie Sakata and Mr. Maki Ogasawara for their help with the preparation of this book.

Finally, I would like to thank Dr. Claus Aschermann, Physics Editor at Springer, for kindly accepting this compilation of lectures as a volume in the Springer Series in Chemical Physics.

Tokyo, April 2009

Kaoru Hirayama

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2.5 HPA (S)	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	2.5.6	2.5.7	2.5.8	2.5.9	2.5.10	2.5.11	2.5.12	2.5.13	2.5.14	2.5.15	2.5.16	2.5.17	2.5.18	2.5.19	2.5.20	2.5.21	2.5.22	2.5.23	2.5.24	2.5.25	2.5.26	2.5.27	2.5.28	2.5.29	2.5.30	2.5.31	2.5.32	2.5.33	2.5.34	2.5.35	2.5.36	2.5.37	2.5.38	2.5.39	2.5.40	2.5.41	2.5.42	2.5.43	2.5.44	2.5.45	2.5.46	2.5.47	2.5.48	2.5.49	2.5.50	2.5.51	2.5.52	2.5.53	2.5.54	2.5.55	2.5.56	2.5.57	2.5.58	2.5.59	2.5.60	2.5.61	2.5.62	2.5.63	2.5.64	2.5.65	2.5.66	2.5.67	2.5.68	2.5.69	2.5.70	2.5.71	2.5.72	2.5.73	2.5.74	2.5.75	2.5.76	2.5.77	2.5.78	2.5.79	2.5.80	2.5.81	2.5.82	2.5.83	2.5.84	2.5.85	2.5.86	2.5.87	2.5.88	2.5.89	2.5.90	2.5.91	2.5.92	2.5.93	2.5.94	2.5.95	2.5.96	2.5.97	2.5.98	2.5.99	2.5.100
2.6 Tunneling	2.6.1	2.6.2	2.6.3	2.6.4	2.6.5	2.6.6	2.6.7	2.6.8	2.6.9	2.6.10	2.6.11	2.6.12	2.6.13	2.6.14	2.6.15	2.6.16	2.6.17	2.6.18	2.6.19	2.6.20	2.6.21	2.6.22	2.6.23	2.6.24	2.6.25	2.6.26	2.6.27	2.6.28	2.6.29	2.6.30	2.6.31	2.6.32	2.6.33	2.6.34	2.6.35	2.6.36	2.6.37	2.6.38	2.6.39	2.6.40	2.6.41	2.6.42	2.6.43	2.6.44	2.6.45	2.6.46	2.6.47	2.6.48	2.6.49	2.6.50	2.6.51	2.6.52	2.6.53	2.6.54	2.6.55	2.6.56	2.6.57	2.6.58	2.6.59	2.6.60	2.6.61	2.6.62	2.6.63	2.6.64	2.6.65	2.6.66	2.6.67	2.6.68	2.6.69	2.6.70	2.6.71	2.6.72	2.6.73	2.6.74	2.6.75	2.6.76	2.6.77	2.6.78	2.6.79	2.6.80	2.6.81	2.6.82	2.6.83	2.6.84	2.6.85	2.6.86	2.6.87	2.6.88	2.6.89	2.6.90	2.6.91	2.6.92	2.6.93	2.6.94	2.6.95	2.6.96	2.6.97	2.6.98	2.6.99	2.6.100
2.7 Time-Dependent Perturbation Theory	2.7.1	2.7.2	2.7.3	2.7.4	2.7.5	2.7.6	2.7.7	2.7.8	2.7.9	2.7.10	2.7.11	2.7.12	2.7.13	2.7.14	2.7.15	2.7.16	2.7.17	2.7.18	2.7.19	2.7.20	2.7.21	2.7.22	2.7.23	2.7.24	2.7.25	2.7.26	2.7.27	2.7.28	2.7.29	2.7.30	2.7.31	2.7.32	2.7.33	2.7.34	2.7.35	2.7.36	2.7.37	2.7.38	2.7.39	2.7.40	2.7.41	2.7.42	2.7.43	2.7.44	2.7.45	2.7.46	2.7.47	2.7.48	2.7.49	2.7.50	2.7.51	2.7.52	2.7.53	2.7.54	2.7.55	2.7.56	2.7.57	2.7.58	2.7.59	2.7.60	2.7.61	2.7.62	2.7.63	2.7.64	2.7.65	2.7.66	2.7.67	2.7.68	2.7.69	2.7.70	2.7.71	2.7.72	2.7.73	2.7.74	2.7.75	2.7.76	2.7.77	2.7.78	2.7.79	2.7.80	2.7.81	2.7.82	2.7.83	2.7.84	2.7.85	2.7.86	2.7.87	2.7.88	2.7.89	2.7.90	2.7.91	2.7.92	2.7.93	2.7.94	2.7.95	2.7.96	2.7.97	2.7.98	2.7.99	2.7.100
2.8 Relativistic Effects	2.8.1	2.8.2	2.8.3	2.8.4	2.8.5	2.8.6	2.8.7	2.8.8	2.8.9	2.8.10	2.8.11	2.8.12	2.8.13	2.8.14	2.8.15	2.8.16	2.8.17	2.8.18	2.8.19	2.8.20	2.8.21	2.8.22	2.8.23	2.8.24	2.8.25	2.8.26	2.8.27	2.8.28	2.8.29	2.8.30	2.8.31	2.8.32	2.8.33	2.8.34	2.8.35	2.8.36	2.8.37	2.8.38	2.8.39	2.8.40	2.8.41	2.8.42	2.8.43	2.8.44	2.8.45	2.8.46	2.8.47	2.8.48	2.8.49	2.8.50	2.8.51	2.8.52	2.8.53	2.8.54	2.8.55	2.8.56	2.8.57	2.8.58	2.8.59	2.8.60	2.8.61	2.8.62	2.8.63	2.8.64	2.8.65	2.8.66	2.8.67	2.8.68	2.8.69	2.8.70	2.8.71	2.8.72	2.8.73	2.8.74	2.8.75	2.8.76	2.8.77	2.8.78	2.8.79	2.8.80	2.8.81	2.8.82	2.8.83	2.8.84	2.8.85	2.8.86	2.8.87	2.8.88	2.8.89	2.8.90	2.8.91	2.8.92	2.8.93	2.8.94	2.8.95	2.8.96	2.8.97	2.8.98	2.8.99	2.8.100
2.9 References	2.9.1	2.9.2	2.9.3	2.9.4	2.9.5	2.9.6	2.9.7	2.9.8	2.9.9	2.9.10	2.9.11	2.9.12	2.9.13	2.9.14	2.9.15	2.9.16	2.9.17	2.9.18	2.9.19	2.9.20	2.9.21	2.9.22	2.9.23	2.9.24	2.9.25	2.9.26	2.9.27	2.9.28	2.9.29	2.9.30	2.9.31	2.9.32	2.9.33	2.9.34	2.9.35	2.9.36	2.9.37	2.9.38	2.9.39	2.9.40	2.9.41	2.9.42	2.9.43	2.9.44	2.9.45	2.9.46	2.9.47	2.9.48	2.9.49	2.9.50	2.9.51	2.9.52	2.9.53	2.9.54	2.9.55	2.9.56	2.9.57	2.9.58	2.9.59	2.9.60	2.9.61	2.9.62	2.9.63	2.9.64	2.9.65	2.9.66	2.9.67	2.9.68	2.9.69	2.9.70	2.9.71	2.9.72	2.9.73	2.9.74	2.9.75	2.9.76	2.9.77	2.9.78	2.9.79	2.9.80	2.9.81	2.9.82	2.9.83	2.9.84	2.9.85	2.9.86	2.9.87	2.9.88	2.9.89	2.9.90	2.9.91	2.9.92	2.9.93	2.9.94	2.9.95	2.9.96	2.9.97	2.9.98	2.9.99	2.9.100
2.10 Index	2.10.1	2.10.2	2.10.3	2.10.4	2.10.5	2.10.6	2.10.7	2.10.8	2.10.9	2.10.10	2.10.11	2.10.12	2.10.13	2.10.14	2.10.15	2.10.16	2.10.17	2.10.18	2.10.19	2.10.20	2.10.21	2.10.22	2.10.23	2.10.24	2.10.25	2.10.26	2.10.27	2.10.28	2.10.29	2.10.30	2.10.31	2.10.32	2.10.33	2.10.34	2.10.35	2.10.36	2.10.37	2.10.38	2.10.39	2.10.40	2.10.41	2.10.42	2.10.43	2.10.44	2.10.45	2.10.46	2.10.47	2.10.48	2.10.49	2.10.50	2.10.51	2.10.52	2.10.53	2.10.54	2.10.55	2.10.56	2.10.57	2.10.58	2.10.59	2.10.60	2.10.61	2.10.62	2.10.63	2.10.64	2.10.65	2.10.66	2.10.67	2.10.68	2.10.69	2.10.70	2.10.71	2.10.72	2.10.73	2.10.74	2.10.75	2.10.76	2.10.77	2.10.78	2.10.79	2.10.80	2.10.81	2.10.82	2.10.83	2.10.84	2.10.85	2.10.86	2.10.87	2.10.88	2.10.89	2.10.90	2.10.91	2.10.92	2.10.93	2.10.94	2.10.95	2.10.96	2.10.97	2.10.98	2.10.99	2.10.100

Contributors

Phere Agostini The Ohio State University, Columbus, OH, USA
 Leo Young Chien Laval University, Quebec, Canada
 Farhad H.M. Faisal Heinrich Heine University, Heineberg, Germany
 Lennard A. Glazier Intense Laser Facilities Laboratory, Istituto Nazionale di Ottica, Consiglio Nazionale delle Ricerche, Arnesio, Roma, CNR, Pisa, Italy, and INFN, Pisa, Italy
 Fumihiko Kanazawa Kansai University, Suita, Japan, kanazawa@sci.kansai-u.jp
 Hirohiko Kuroki Tohoku University, Sendai, Japan
 Katsunori Mikihiro Kansai Laser Technology Laboratory, RIKEN Advanced Science Institute, Suita, Japan
 Kazumasa G. Nakamura Materials and Processes Laboratory, Tokyo Institute of Technology, Yokohama, Japan
 Hiroyoshi Nakamura NTT Data Research Laboratories, NTT Corporation, Kanagawa, Japan
 Howard R. Babi American University, Washington, DC, USA, and Max Planck Institute, Berlin, Germany

Chapter 1
Introduction to Atomic Dynamics in Intense
Light Fields

Farhad H.M. Faisal

Abstract A brief description is given of the early developments leading to the discovery of some of the basic phenomena that occur during the interaction of intense light fields with atomic systems – such as multiphoton ionization (MPI), above-threshold ionization (ATI), and high-harmonic generation (HHG). Also outlined are the related theoretical concepts and the nonperturbative “RNR model” for interpreting the phenomena. Recent observation of the breakdown of a popular “resonance model” (Keldysh $\gamma \ll 1$) is noted and the role of discrete photon effects that can account for the observed parallel momentum distribution is given. Next, the role of π -correlation in intense-field processes in many-electron atomic systems is discussed. A systematic analysis of intense-field problems using the “intense-field many-body S -matrix theory” (IMST) is outlined. In this end, the basic motivation behind and the derivation of IMST is discussed, and its use is illustrated by application to the problem of nonresonant double ionization (NDI) that provided a fully quantum analysis of the mechanism behind the NDI process. Also discussed is how NDI and its opposite, sequential double ionization (SDI), can both occur in intense fields depending, respectively, on ionization and ultraviolet wavelengths of the light field used. A motivation for multiple ionization is suggested by the IMST diagrams, which can provide a good estimate of the known experimental observations of the ion state vs. intensity in noble gases. Finally, an example is given of the spatial distribution of the charge state that can be produced in the focal region of a “flying reaction vessel” of an intense Ti:apphire laser.

1.1 Introduction

This presentation has two parts and is intended as an introduction to the subject of intense-field physics. I shall begin by briefly mentioning the historical development of the field of intense-field physics – or intense-field science in a broader

H.M. Faisal
 Heinrich Heine University, Heineberg, Germany

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