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Membrane Spectroscopy

Edited by Ernst Grell



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Membrane Spectroscopy

Dennis Chapman



Membrane Spectroscopy:

Membrane Spectroscopy E. Grell, 2012-12-06 The last 10 years have seen an enormous growth in our understanding of the molecular organisation of biological membranes Experimental methods have been devised to measure the translational and rotational mobility of lipids and proteins thereby furnishing a quantitative basis for the concept of membrane fluidity Likewise the asymmetry of bilayer membranes as evidenced by the asymmetric insertion of proteins and lipids has been put on firm experimental ground At higher molecular resolution it has been possible to provide a detailed picture of the molecular conformation and dynamics of lipids and to some extent even of small peptides embedded in a bilayer matrix Many of these achievements would not have been possible without the application of modern spectroscopic methods Since these techniques are scattered in a variety of specialized textbooks the present monograph attempts to describe the key spectroscopic methods employed in present day membrane research at an intermediate level There is no question that the elusive detailed structure of the biological membrane demands a multiplicity of experimental approaches and that no single spectroscopic method can cover the full range of physical phenomena encountered in a membrane Much confusion in the literature has arisen by undue generalizations without considering the frequency range or other limitations of the methods employed It is to be hoped that the present monograph with its comprehensive description of most modern spectroscopic techniques will contribute to Spectroscopic Membrane Probes Leslie M. Loew, 2018-04-17 The optical spectra of molecular membrane probes can be interpreted in terms of the structure dynamics and the physiological state of the membrane The general picture we have of membranes and of the properties of the proteins imbedded in them has arguably emerged directly from probe studies over the last 20 years This work is designed to make these techniques accessible to a broad audience of cell biologist The techniques discussed revolve primarily around the fluorescence of membrane probes but applications of light absorption and Raman scattering are included In addition to reviews of the major applications most chapters include information on required apparatus experimental design data analysis and potential pitfalls Methods in Membrane Lipids Alex M. Dopico, 2007-08-30 This book presents a compendium of methodologies for the study of membrane lipids varying from traditional lab bench experimentation to computer simulation and theoretical models The volume provides a comprehensive set of techniques for studying membrane lipids with a strong biophysical emphasis It compares the various available techniques including the pros and cons as seen by the experts *A Molecular Description of Biological Membrane Components by Computer Aided Conformational Analysis* Robert Brasseur, 2019-07-18 First published in 1990 the goal of these two volumes is to help fill the gap between theory and experiment in membrane science Those involved with biochemistry biophysics pharmacology and biology will find these volumes interesting and informative **Biomembrane Structures** Parvez I. Harris, Dennis Chapman, 1998 Biological membranes play a significant role in a range of biological processes such as ion transport and signal transduction Over the years much effort has been devoted towards developing an

understanding of biomembrane structure The study of this subject is now reaching an important stage This is because at last the full three dimensional structure of certain membrane proteins is beginning to be resolved In the past three dimensional structures of membrane proteins were difficult to obtain as only two dimensional crystals were available In recent years satisfactory crystals have been obtained and X ray diffraction techniques have been applied This has led to the three dimensional structures of the photosynthetic reaction centres porins and more recently the structure of cytochrome oxidase Of course not all membrane proteins are readily crystallisable and some are not even available in sufficient quantities to obtain the necessary crystals or to carry out biophysical experiments In some cases e g the voltage gated potassium ion channel membrane proteins their structure has been proposed mainly on the basis of molecular biology methods This has prompted the search for alternative approaches for characterising biomembrane structure Molecular biological studies are providing a wealth of information on a number of different membrane proteins Combining the information derived from such studies with molecular modelling is becoming extremely useful for relating structure to function Development of other approaches include synthesis and structure function analysis of peptides corresponding to functionally important domains of membrane proteins This book presents a series of Chapters discussing how a combination of molecular biological biophysical and theoretical molecular modelling techniques are helping us to obtain a much clearer picture of biomembrane structure After an introductory Chapter on the Principles of membrane Protein Structure the book is divided into two sections one dealing with crystallographic approaches and the other non crystallographic approaches such as NMR AFM SPR and FTIR spectroscopy Chapters dealing with the recently solved crystal structure of cytochrome oxidase and bacteriorhodopsin are presented The book contains contributions from leading membrane scientists describing their latest studies It provides an up to date coverage of the developments in the field of biomembranes with particular emphasis on membrane proteins

Membrane Characterization Nidal Hilal,Ahmad Fauzi Ismail,Takeshi Matsuura,Darren Oatley-Radcliffe,2017-02-18 Membrane Characterization provides a valuable source of information on how membranes are characterized an extremely limited field that is confined to only brief descriptions in various technical papers available online For the first time readers will be able to understand the importance of membrane characterization the techniques required and the fundamental theory behind them This book focuses on characterization techniques that are normally used for membranes prepared from polymeric ceramic and composite materials Features specific details on many membrane characterization techniques for various membrane materials of industrial and academic interest Contains examples of international best practice techniques for the evaluation of several membrane parameters including pore size charge and fouling Discusses various membrane models more suitable to a specific application Provides examples of ab initio calculations for the design optimization and scale up of processes based on characterization data

Membrane Organization and Dynamics Amitabha Chattopadhyay,2017-12-06 This volume brings together information on membrane organization and dynamics from a variety

of spectroscopic microscopic and simulation approaches spanning a broad range of time scales The implication of such dynamic information on membrane function in health and disease is a topic of contemporary interest The chapters cover various aspects of membrane lipid and protein dynamics explored using a battery of experimental and theoretical approaches The synthesis of information and knowledge gained by utilizing multiple approaches will provide the reader with a comprehensive understanding of the underlying membrane dynamics and function which will help to develop robust dynamic models for the understanding of membrane function in healthy and diseased states In the last few years crystal structures of an impressive number of membrane proteins have been reported thanks to tremendous advances in membrane protein crystallization techniques Some of these recently solved structures belong to the G protein coupled receptor GPCR family which are particularly difficult to crystallize due to their intrinsic flexibility Nonetheless these static structures do not provide the necessary information to understand the function of membrane proteins in the complex membrane milieu This volume will address the dynamic nature of membrane proteins within the membrane and will provide the reader with an up to date overview of the theory and practical approaches that can be used This volume will be invaluable to researchers working in a wide range of scientific areas from biochemistry and molecular biology to biophysics and protein science Students of these fields will also find this volume very useful This book will also be of great use to those who are interested in the dynamic nature of biological processes

Ceramic Membranes Vitaly Gitis,Gadi Rothenberg,2016-08-22 Ein wichtiges Lehrwerk f r ein zunehmend wichtiges Fachgebiet gelungene Einf hrung pr gnante Darstellung der Grundlagen der Membranseparation berblick ber Charakterisierungstechniken f r keramische Membranen industrielle Anwendungen und deren Wirtschaftlichkeit

Fluorescent Methods to Study Biological Membranes Yves Mely,Guy Duportail,2012-10-10 Biological membranes play a central role in cell structure shape and functions However investigating the membrane bilayer has proved to be difficult due to its highly dynamic and anisotropic structure which generates steep gradients at the nanometer scale Due to the decisive impact of recently developed fluorescence based techniques tremendous advances have been made in the last few years in our understanding of membrane characteristics and functions In this context the present book illustrates some of these major advances by collecting review articles written by highly respected experts The book is organized in three parts the first of which deals with membrane probes and model membranes The second part describes the use of advanced quantitative and high resolution techniques to explore the properties of biological membranes illustrating the key progress made regarding membrane organization dynamics and interactions The third part is focused on the investigation of membrane proteins using the same techniques and notably on the membrane receptors that play a central role in signaling pathways and therapeutic strategies All chapters provide comprehensive information on membranes and their exploration for beginners in the field and advanced researchers alike

Mycoplasma Cell Membranes Shlomo Rottem,Itzhak Kahane,2012-12-06 The mycoplasmas a trivial name used to denote organisms included in the class

Mollicutes are a group of prokaryotic organisms comprising more than 120 species distinguished from ordinary bacteria by their small size and the total lack of cell walls. The absence of a cell wall in mycoplasmas is a characteristic of outstanding importance to which the mycoplasmas owe many of their peculiarities for example their morphological instability, osmotic sensitivity, unique ion pumping systems, resistance to antibiotics that interfere with cell wall biosynthesis and susceptibility to lysis by detergents and alcohols. The fact that the mycoplasma cells contain only one membrane type, the plasma membrane, constitutes one of their most useful properties for membrane studies: once the membrane is isolated, it is uncontaminated with other membrane types. Another advantage in using mycoplasmas as models for membrane studies stems from the fact that their membrane lipid composition can be altered in a controlled manner. This characteristic results from the partial or total inability of the mycoplasmas to synthesize long chain fatty acids and cholesterol, making mycoplasmas dependent on the supply of fatty acids from the growth medium. The ability to introduce controlled alterations in the fatty acid composition and cholesterol content of mycoplasma membranes has been utilized in studying the molecular organization and physical properties of biological membranes.

The Enzymes of Biological Membranes A.N.

Martonosi, 2012-12-06 In the first edition of *The Enzymes of Biological Membranes* published in four volumes in 1976 we collected the mass of widely scattered information on membrane linked enzymes and metabolic processes up to about 1975. This was a period of transition from the romantic phase of membrane biochemistry preoccupied with conceptual developments and the general properties of membranes to an era of mounting interest in the specific properties of membrane linked enzymes analyzed from the viewpoints of modern enzymology. The level of sophistication in various areas of membrane research varied widely: the structures of cytochrome c and cytochrome b₅ were known to atomic detail while the majority of membrane linked enzymes had not even been isolated. In the intervening eight years our knowledge of membrane linked enzymes expanded beyond the wildest expectations. The purpose of the second edition of *The Enzymes of Biological Membranes* is to record these developments. The first volume describes the physical and chemical techniques used in the analysis of the structure and dynamics of biological membranes. In the second volume the enzymes and metabolic systems that participate in the biosynthesis of cell and membrane components are discussed. The third and fourth volumes review recent developments in active transport, oxidative phosphorylation and photosynthesis.

[Comprehensive Membrane Science and Engineering](#) Enrico Drioli, Lidietta Giorno, Enrica Fontananova, 2017-07-20 *Comprehensive Membrane Science and Engineering* Second Edition Four Volume Set is an interdisciplinary and innovative reference work on membrane science and technology. Written by leading researchers and industry professionals from a range of backgrounds, chapters elaborate on recent and future developments in the field of membrane science and explore how the field has advanced since the previous edition published in 2010. Chapters are written by academics and practitioners across a variety of fields including chemistry, chemical engineering, material science, physics, biology and food science. Each volume covers a wide spectrum of applications.

and advanced technologies such as new membrane materials e g thermally rearranged polymers polymers of intrinsic microporosity and new hydrophobic fluoropolymer and processes e g reverse electrodialysis membrane contractors membrane crystallization membrane condenser membrane dryers and membrane emulsifiers that have only recently proved their full potential for industrial application This work covers the latest advances in membrane science linking fundamental research with real life practical applications using specially selected case studies of medium and large scale membrane operations to demonstrate successes and failures with a look to future developments in the field Contains comprehensive cutting edge coverage helping readers understand the latest theory Offers readers a variety of perspectives on how membrane science and engineering research can be best applied in practice across a range of industries Provides the theory behind the limits advantages future developments and failure expectations of local membrane operations in emerging countries

Membrane Fluidity Morris Kates, 2012-12-06 The aim of this book is to bring together in one volume the current research and thought on the concept of membrane fluidity as a biological phenomenon The invited articles are intended to review recent developments in the areas of membrane research covered and to summarize the current concepts and theories in those areas The authors have been given ample opportunity to present their thoughts and speculation on membrane fluidity and related phenomena in a more expanded form than is usually possible in reviews of this type It is hoped that this approach will have a stimulating effect on research and theoretical development in the biomembrane field The chapters in this book are arranged in three sections the first of which covers physical studies of membrane fluidity and related phenomena on the molecular level Included are chapters on intermolecular hydrogen bonding between membrane lipids thermal analysis of membranes application of fluorescence and NMR spectrometry to the study of membrane fluidity and the effect of drugs and other compounds on membrane stability and fluidity The second section deals with the regulation of membrane fluidity in microorganisms plants and higher organisms by factors such as temperature fatty acid chain length lipid desaturation and polar head group structure

Membrane Physiology Thomas E. Andreoli, Darrell D. Fanestil, Joseph F. Hoffman, Stanley G. Schultz, 2012-12-06 Membrane Physiology Second Edition is a soft cover book containing portions of Physiology of Membrane Disorders Second Edition The parent volume contains six major sections This text encompasses the first three sections The Nature of Biological Membranes Methods for Studying Membranes and General Problems in Membrane Biology We hope that this smaller volume will be helpful to individuals interested in general physiology and the methods for studying general physiology THOMAS E ANDREOLI JOSEPH F HOFFMAN DARRELL D FANESTIL STANLEY G SCHULTZ vii Preface to the Second Edition The second edition of Physiology of Membrane Disorders represents an extensive revision and a considerable expansion of the first edition Yet the purpose of the second edition is identical to that of its predecessor namely to provide a rational analysis of membrane transport processes in individual membranes cells tissues and organs which in turn serves as a frame of reference for rationalizing disorders in which derangements of membrane

transport processes play a cardinal role in the clinical expression of disease. As in the first edition this book is divided into a number of individual but closely related sections. Part V represents a new section where the problem of transport across epithelia is treated in some detail. Finally Part VI which analyzes clinical derangements has been enlarged appreciably.

Extending the X-ray Study of Membrane Fusion in Supported Multibilayers Towards Physiological Conditions Yihui Xu, 2017

Fluorescence Studies on Biological Membranes Herwig J. Hilderson, 2012-12-06 As stated by its first editor Dr D B Roodyn the primary goal of the series Subcellular Biochemistry is to achieve an integrated view of the cell by bringing together results from a wide range of different techniques and disciplines. This volume deals with the applications of fluorescence spectroscopy to membrane research. It seeks to present complementary biochemical and biophysical data on both the structure and the dynamics of biological membranes. Biophysics and biochemistry are improving more and more in their ability to study biomembranes overlapping somewhat in this area and explaining the functioning of the whole cell in terms of the properties of its individual components. Therefore we have brought together an international group of experts in order to report on and review advances in fluorescence studies on biological membranes thereby highlighting subcellular aspects. The first chapters present a critical evaluation of the current applications of dynamic and steady state fluorescence techniques. Subsequent chapters discuss more specific applications in cells, biological membranes and their constituents: lipids, proteins.

Biomembrane Structure and Function Dennis Chapman, 1983-06-18

Vibrational Spectroscopy in Diagnosis and Screening IOS Press (Firm), 2012-06-15 In recent years there has been a tremendous growth in the use of vibrational spectroscopic methods for diagnosis and screening. These applications range from diagnosis of disease states in humans such as cancer to rapid identification and screening of microorganisms. The growth in such types of studies has been possible thanks to advances in instrumentation and associated computational and mathematical tools for data processing and analysis. This volume of Advances in Biomedical Spectroscopy contains chapters from leading experts who discuss the latest advances in the application of Fourier transform infrared (FTIR), Near infrared (NIR), Terahertz and Raman spectroscopy for diagnosis and screening in fields ranging from medicine, dentistry, forensics and aquatic science. Many of the chapters provide information on sample preparation, data acquisition and data interpretation that would be particularly valuable for new users of these techniques including established scientists and graduate students in both academia and industry.

Principles of Fluorescence Spectroscopy Joseph R. Lakowicz, 2007-12-05 The third edition of this established classic text/reference builds upon the strengths of its very popular predecessors. Organized as a broadly useful textbook, Principles of Fluorescence Spectroscopy, 3rd edition maintains its emphasis on basics while updating the examples to include recent results from the scientific literature. The third edition includes new chapters on single molecule detection, fluorescence correlation spectroscopy, novel probes and radiative decay engineering. Includes a link to Springer Extras to download files reproducing all book artwork for easy use in lecture slides. This is an essential volume for students, researchers and industry professionals.

in biophysics biochemistry biotechnology bioengineering biology and medicine **Physical Chemistry of Biological Interfaces** Adam Baszkin, Willem Norde, 1999-11-22 An introduction to the most important fundamental concepts of physicochemical interface science and a description of experimental techniques and applications of surface science in relation to biological systems It explores artificial assemblies of lipids proteins and polysaccharides that perform novel functions that living systems cannot duplicat

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