Small Angle X Ray And Neutron Scattering From Biomacromolecular Solutions

#Small Angle X-ray Scattering #Small Angle Neutron Scattering #Biomacromolecular Solutions #Protein Structure Analysis #Structural Biology Techniques

Explore how Small Angle X-ray Scattering (SAXS) and Small Angle Neutron Scattering (SANS) are employed to analyze biomacromolecular solutions. These powerful techniques provide critical insights into the structure, size, and interactions of proteins, nucleic acids, and other biological macromolecules, advancing our understanding of their function and behavior in solution states.

Our collection supports both foundational studies and cutting-edge discoveries.

Small Angle X-Ray and Neutron Scattering from Solutions of Biological Macromolecules

This book describes all aspects of the technique of small-angle scattering of X-rays and neutrons, including instrumentation, sample requirements, data interpretation and modelling methods, in a comprehensive way and gives examples of applications in various fields of biophysics and biochemistry.

Handbook of Food Structure Development

The most useful properties of food, i.e. the ones that are detected through look, touch and taste, are a manifestation of the food’s structure. Studies about how this structure develops or can be manipulated during food production and processing are a vital part of research in food science. This book provides the status of research on food structure and how it develops through the interplay between processing routes and formulation elements. It covers food structure development across a range of food settings and consider how this alters in order to design food with specific functionalities and performance. Food structure has to be considered across a range of length scales and the book includes a section focusing on analytical and theoretical approaches that can be taken to analyse/characterise food structure from the nano- to the macro-scale. The book concludes by outlining the main challenges arising within the field and the opportunities that these create in terms of establishing or growing future research activities. Edited and written by world class contributors, this book brings the literature up-to-date by detailing how the technology and applications have moved on over the past 10 years. It serves as a reference for researchers in food science and chemistry, food processing and food texture and structure.

Magnetic Small-Angle Neutron Scattering

Magnetic Small-Angle Neutron Scattering provides the first extensive treatment of magnetic small-angle neutron scattering (SANS). The theoretical background required to compute magnetic SANS cross sections and correlation functions related to long-wavelength magnetization structures is laidout. The concepts are scrutinized based on the discussion of experimental neutron data. Regarding prior background knowledge, some familiarity with the basic magnetic interactions and phenomena as well as scattering theory is desired.Besides exposing the different origins of magnetic SANS, and furnishing the basics of the magnetic SANS technique in early chapters, a large part of the book is devoted to a comprehensive treatment of the continuum theory of micromagnetics, as it is relevant for the study of the elastic magneticSANS cross section. Analytical expressions for the magnetization Fourier components allow to highlight the essential features of magnetic SANS and to analyze experimental data both in reciprocal, as well as in real space. Later chapters provide an overview on the magnetic SANS of nanoparticles andso-called complex systems (e.g., ferrofluids, magnetic steels, spin glasses and amorphous magnets). It is this subfield where major progress is expected to be made in the coming years, mainly via the increased usage of numerical micromagnetic simulations (Chapter 7), which is a very promisingapproach for the understanding of the magnetic SANS from systems exhibiting nanoscale spin inhomogeneity.

Temperature-Responsive Polymers

An authoritative resource that offers an understanding of the chemistry, properties and applications of temperature-responsive polymers With contributions from a distinguished panel of experts, Temperature-Responsive Polymers puts the focus on hydrophilic polymers capable of changing their physicochemical properties in response to changes in environmental temperature. The contributors review the chemistry of these systems, and discuss a variety of synthetic approaches for preparation of temperature-responsive polymers, physicochemical methods of their characterisation and potential applications in biomedical areas. The text reviews a wide-variety of topics including: The characterisation of temperature-responsive polymers; Infrared and Raman spectroscopy; Applications of temperature-responsive polymers grafted onto solid core nanoparticles; and much more. The contributors also explore how temperature-responsive polymers can be used in the biomedical field for applications such as tissue engineering. This important resource: Offers an important synthesis of the current research on temperature-responsive polymers Covers the chemistry, the synthetic approaches for presentation and the physiochemical method of temperature-responsive polymers Includes a review of the fundamental characteristics of temperature-responsive polymers Explores many of the potential applications in biomedical science, including drug delivery and gene therapy Written for polymer scientists in both academia and industry as well as postgraduate students working in the area of stimuli-responsive materials, this vital text offers an exploration of the chemistry, properties and current applications of temperature-responsive polymers.

Synchrotron Light Sources and Free-Electron Lasers

Hardly any other discovery of the nineteenth century did have such an impact on science and technology as Wilhelm Conrad Röntgen’s seminal find of the X-rays. X-ray tubes soon made their way as excellent instruments for numerous applications in medicine, biology, materials science and testing, chemistry and public security. Developing new radiation sources with higher brilliance and much extended spectral range resulted in stunning developments like the electron synchrotron and electron storage ring and the freeelectron laser. This handbook highlights these developments in fifty chapters. The reader is given not only an inside view of exciting science areas but also of design concepts for the most advanced light sources. The theory of synchrotron radiation and of the freeelectron laser, design examples and the technology basis are presented. The handbook presents advanced concepts like seeding and harmonic generation, the booming field of Terahertz radiation sources and upcoming brilliant light sources driven by laser-plasma accelerators. The applications of the most advanced light sources and the advent of nanobeams and fully coherent x-rays allow experiments from which scientists in the past could not even dream. Examples are the diffraction with nanometer resolution, imaging with a full 3D reconstruction of the object from a diffraction pattern, measuring the disorder in liquids with high spatial and temporal resolution. The 20th century was dedicated to the development and improvement of synchrotron light sources with an ever ongoing increase of brilliance. With ultrahigh brilliance sources, the 21st century will be the century of x-ray lasers and their applications. Thus, we are already close to the dream of condensed matter and biophysics: imaging single (macro)molecules and measuring their dynamics on the femtosecond timescale to produce movies with atomic resolution.

Modern Aspects of Small-Angle Scattering

Proceedings of the NATO Advanced Study Institute, Como, Italy, May 12--22, 1993

Small Angle X-ray Scattering

This book provides a clear, comprehensible and up-to-date description of how Small Angle Scattering (SAS) can help structural biology researchers. SAS is an efficient technique that offers structural information on how biological macromolecules behave in solution. SAS provides distinct and complementary data for integrative structural biology approaches in combination with other widely used probes, such as X-ray crystallography, Nuclear magnetic resonance, Mass spectrometry and Cryo-electron Microscopy. The development of brilliant synchrotron small-angle X-ray scattering (SAXS) beam lines has increased the number of researchers interested in solution scattering. SAS is especially useful for studying conformational changes in proteins, highly flexible proteins, and intrinsically disordered proteins. Small-angle neutron scattering (SANS) with neutron contrast variation is ideally suited for studying multi-component assemblies as well as membrane proteins that are stabilized in surfactant micelles or vesicles. SAS is also used for studying dynamic processes of protein fibrillation in amyloid diseases, and pharmaceutical drug delivery. The combination with size-exclusion chromatography further increases the range of SAS applications. The book is written by leading experts in solution SAS methodologies. The principles and theoretical background of various SAS techniques are included, along with practical aspects that range from sample preparation to data presentation for publication. Topics covered include techniques for improving data quality and analysis, as well as different scientific applications of SAS. With abundant illustrations and practical tips, we hope the clear explanations of the principles and the reviews on the latest progresses will serve as a guide through all aspects of biological solution SAS. The scope of this book is particularly relevant for structural biology researchers who are new to SAS. Advanced users of the technique will find it helpful for exploring the diversity of solution SAS methods and applications. Chapter 3 of this book is available open access under a CC BY 4.0 license at link.springer.com.

Biological Small Angle Scattering: Techniques, Strategies and Tips

Small Angle Scattering, Part A: Methods for Structural Investigation, Volume 675 in the Methods in Enzymology series, highlights new advances in the field, with new chapters in this updated release including SAXS foundations and metrics, Contrast variation sample preparation protocols, experimental procedures, and rudimentary analysis, Molecular deuteration for neutron scattering, Planning, Executing and Assessing the Feasibility of SANS Contrast Variation Experiments, Technical considerations for small-angle neutron scattering from biological macromolecules, and Advanced sample environments and capabilities at our synchrotron X-ray beamline with example applications. Additional sections in the book cover SEC-SAXS-MALS data acquisition and processing pipeline at SIBYLS, SEC-SAXS: pros and cons, experimental set-up, examples and software developments, Radiation damage and sample economy for stopped-flow methods in the time regime of millisecond and above, Stopped-flow-time-resolved SAXS, Insights on Temp-jump, time-resolved SAXS, and much more. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Methods in Enzymology series Includes the latest information on Small Angle Scattering: Methods for Structural Investigation

Small Angle Scattering Part A: Methods for Structural Investigation

Given the immense progress achieved in elucidating protein-protein complex structures and in the field of protein interaction modeling, there is great demand for a book that gives interested researchers/students a comprehensive overview of the field. This book does just that. It focuses on what can be learned about protein-protein interactions from the analysis of protein-protein complex structures and interfaces. What are the driving forces for protein-protein association? How can we extract the mechanism of specific recognition from studying protein-protein interfaces? How can this knowledge be used to predict and design protein-protein interactions (interaction regions and complex structures)? What methods are currently employed to design protein-protein interactions, and how can we influence protein-protein interactions by mutagenesis and small-molecule drugs or peptide mimetics?The book consists of about 15 review chapters, written by experts, on the characterization of protein-protein interfaces, structure determination of protein complexes (by NMR and X-ray), theory of protein-protein binding, dynamics of protein interfaces, bioinformatics methods to predict interaction regions, and prediction of protein-protein complex structures (docking and homology modeling of complexes, etc.) and

design of protein-protein interactions. It serves as a bridge between studying/analyzing protein-protein complex structures (interfaces), predicting interactions, and influencing/designing interactions.

Protein-protein Complexes

This book focuses on the widely used experimental techniques available for the structural, morphological, and spectroscopic characterization of materials. Recent developments in a wide range of experimental techniques and their application to the quantification of materials properties are an essential side of this book. Moreover, it provides concise but thorough coverage of the practical and theoretical aspects of the analytical techniques used to characterize a wide variety of functional nanomaterials. The book provides an overview of widely used characterization techniques for a broad audience: from beginners and graduate students, to advanced specialists in both academia and industry.

Small-Angle Scattering of X-Rays

The technique of smal1-angle soattering (SAS) is now about sixty years o1d. Soon after the first observations of, a continuous, intense X-ray scattering near the primary beam from samp1es such as canbo:tt,bla:cks, it was recognized that this scattering arose from e1ectron density heterogeneities on a scale of severa! tens to severa! hundred times the wave1ength of the radiation used. By the time the classic monograph of Guinier and Foumet appeared in 1955, much of the basic theory and instrumentation had been developed, and applications to colloidal suspensions, macromolecular solutions inc1uding proteins and viruses, fibers, porous and finely divided solids, metallic alloys etc. numbered in the hundreds. Following severa! specialized meetings, the first international conference on small-ang1e X-ray scattering was helditi, Syracuse in 1965, marked by the presentation of new scattering theory for polydisperse systems, polymer coils and filaments, new instrumentation (the Bonse-Hart camera), and new applications to polymeric, biologica!, and metallic systems, to critica! phenomena and to catalysts. The second conference (Graz, 1970) no longer dealt exclusively with X ray scattering, but also inc1uded neutron small-angle scattering (SANS). SANS applications developed rapidly during this period, especially for studying synthetic and biologica! macromolecules, when the possibilities of exploiting scattering length density differences, created by selective deuteration, were recognized.

Small-angle X-ray Scattering

Filling the gap for a reference dedicated to the characterization of polymer blends and their micro and nano morphologies, this book provides comprehensive, systematic coverage in a one-stop, two-volume resource for all those working in the field. Leading researchers from industry and academia, as well as from government and private research institutions around the world summarize recent technical advances in chapters devoted to their individual contributions. In so doing, they examine a wide range of modern characterization techniques, from microscopy and spectroscopy to diffraction, thermal analysis, rheology, mechanical measurements and chromatography. These methods are compared with each other to assist in determining the best solution for both fundamental and applied problems, paying attention to the characterization of nanoscale miscibility and interfaces, both in blends involving copolymers and in immiscible blends. The thermodynamics, miscibility, phase separation, morphology and interfaces in polymer blends are also discussed in light of new insights involving the nanoscopic scale. Finally, the authors detail the processing-morphology-property relationships of polymer blends, as well as the influence of processing on the generation of micro and nano morphologies, and the dependence of these morphologies on the properties of blends. Hot topics such as compatibilization through nanoparticles, miscibility of new biopolymers and nanoscale investigations of interfaces in blends are also addressed. With its application-oriented approach, handpicked selection of topics and expert contributors, this is an outstanding survey for anyone involved in the field of polymer blends for advanced technologies.

Handbook of Materials Characterization

Small-angle scattering of X rays and neutrons is a widely used diffraction method for studying the structure of matter. This method of elastic scattering is used in various branches of science and technology, includ ing condensed matter physics, molecular biology and biophysics, polymer science, and metallurgy. Many small-angle scattering studies are of value for pure science and practical applications. It is well known that the most general and informative method for investigating the spatial

structure of matter is based on wave-diffraction phenomena. In diffraction experiments a primary beam of radiation influences a studied object, and the scattering pattern is analyzed. In principle, this analysis allows one to obtain information on the structure of a substance with a spatial resolution determined by the wavelength of the radiation. Diffraction methods are used for studying matter on all scales, from elementary particles to macro-objects. The use of X rays, neutrons, and electron beams, with wavelengths of about 1 A, permits the study of the condensed state of matter, solids and liquids, down to atomic resolution. Determination of the atomic structure of crystals, i.e., the arrangement of atoms in a unit cell, is an important example of this line of investigation.

Modern Aspects of Small-Angle Scattering

"The heterogeneous structure of synaptic vesicles isolated from rat brain is investigated considering solution small-angle x-ray scattering data in combination with data obtained by cryogenic electron microscopy, dynamic light scattering and biochemical analysis. Overall low resolution structural models of the entire functional synaptic vesicle are proposed, elucidating details on the density profile of the membrane, including contributions from the lipids and the proteins, as well as addressing the average conformation and overall lateral organization of proteins in micro-domains on the average synaptic vesicle under quasi-physiological conditions. Entropic contributions to free energy due to possible protein cluster formation and disintegration on the synaptic vesicle are investigated. Further, cell free fusion systems are characterized employing dynamic light scattering and applicability of small-angle x-ray scattering is considered for investigating membrane fusion processes."--Open Textbook Library.

Characterization of Polymer Blends

Small Angle Scattering, Part A: Methods for Structural Investigation, Volume 675 in the Methods in Enzymology series, highlights new advances in the field, with new chapters in this updated release including SAXS foundations and metrics, Contrast variation sample preparation protocols, experimental procedures, and rudimentary analysis, Molecular deuteration for neutron scattering, Planning, Executing and Assessing the Feasibility of SANS Contrast Variation Experiments, Technical considerations for small-angle neutron scattering from biological macromolecules, and Advanced sample environments and capabilities at our synchrotron X-ray beamline with example applications. Additional sections in the book cover SEC-SAXS-MALS data acquisition and processing pipeline at SIBYLS, SEC-SAXS: pros and cons, experimental set-up, examples and software developments, Radiation damage and sample economy for stopped-flow methods in the time regime of millisecond and above, Stopped-flow-time-resolved SAXS, Insights on Temp-jump, time-resolved SAXS, and much more. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Methods in Enzymology series Includes the latest information on Small Angle Scattering: Methods for Structural Investigation

Structure Analysis by Small-Angle X-Ray and Neutron Scattering

This volume looks at the different spectroscopic and biophysical methods used by researchers to study the structure and folding of RNA, and to follow their interactions with proteins. The chapters in this book cover topics such as single-molecule spectroscopy of multiple RNA species; surface plasmon resonance, MS or microcalorimetry for investigating molecular interactions with RNA; FTIR, SAXS, SANS and SRCD spectroscopies to analyze RNA structure; use of fluorescent nucleotides to map RNA-binding sites on proteins surfaces or CryoEM; and much more. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on troubleshooting and avoiding known pitfalls. Cutting-edge and comprehensive, RNA Spectroscopy: Methods and Protocols is a valuable resource for anyone interested in learning more about this developing field.

Synaptic Vesicles studied by small-angle X-ray Scattering

This work presents a snapshot of the state of the art of modern biomolecular crystallography, from crystallisation through structure determination and even interactive presentation on the web. Methods driving the latest automated structure determination pipelines are explained, as well as how to deal with problems such as crystal pathologies that still demand expert analysis. These methods are illustrated through their application to problems of great biological interest, such as the molecular machinery underlying the complement pathway, the mechanism of action of monoamine oxidase inhibitors, and

the structure of the eukaryotic ribosome. Complementary approaches, such as neutron diffraction, small angle X-ray scattering, coherent diffraction and computational modelling, are also explored.

Neutrons in Biology

This volume is a collection of the contributions presented at the 42nd Erice Crystallographic Course whose main objective was to train the younger generation on advanced methods and techniques for examining structural and dynamic aspects of biological macromolecules. The papers review the techniques used to study protein assemblies and their dynamics, including X-ray diffraction and scattering, electron cryo-electron microscopy, electro nanospray mass spectrometry, NMR, protein docking and molecular dynamics. A key theme throughout the book is the dependence of modern structural science on multiple experimental and computational techniques, and it is the development of these techniques and their integration that will take us forward in the future.

Small Angle Scattering Part A: Methods for Structural Investigation

Synchrotron radiation is today extensively used for fundamental and applied research in many different fields of science. Its exceptional characteristics in terms of intensity, brilliance, spectral range, time structure and now also coherence pushed many experimental techniques to previously un-reachable limits, enabling the performance of experiments unbelievable only few years ago. The book gives an up-to-date overview of synchrotron radiation research today with a view to the future, starting from its generation and sources, its interaction with matter, illustrating the main experimental technique employed and provides an overview of the main fields of research in which new and innovative results are obtained. The book is addressed to PhD students and young researchers to provide both an introductory and a rather deep knowledge of the field. It will also be helpful to experienced researcher who want to approach the field in a professional way.

RNA Spectroscopy

This book addresses both classic concepts and state-of-the-art technologies surrounding cellulose science and technology. Integrating nanoscience and applications in materials, energy, biotechnology, and more, the book appeals broadly to students and researchers in chemistry, materials, energy, and environmental science. • Includes contributions from leading cellulose scientists worldwide, with five Anselm Payen Cellulose Award winners and two Hayashi Jisuke Cellulose Award winners • Deals with a highly applicable and timely topic, considering the current activities in the fields of bioeconomies, biorefineries, and biomass utilization • Maximizes readership by combining fundamental science and application development

Advancing Methods for Biomolecular Crystallography

Quantitative methods are revolutionizing modern molecular and cellular biology. Groundbreaking technical advances are fueling the rapid expansion in our ability to observe, as seen in multidisciplinary studies that integrate theory, computation, experimental assays, and the control of microenvironments. Integrating new experimental and theoretical

Macromolecular Crystallography

Small-angle scattering of X rays and neutrons is a widely used diffraction method for studying the structure of matter. This method of elastic scattering is used in various branches of science and technology, includ ing condensed matter physics, molecular biology and biophysics, polymer science, and metallurgy. Many small-angle scattering studies are of value for pure science and practical applications. It is well known that the most general and informative method for investigating the spatial structure of matter is based on wave-diffraction phenomena. In diffraction experiments a primary beam of radiation influences a studied object, and the scattering pattern is analyzed. In principle, this analysis allows one to obtain information on the structure of a substance with a spatial resolution determined by the wavelength of the radiation. Diffraction methods are used for studying matter on all scales, from elementary particles to macro-objects. The use of X rays, neutrons, and electron beams, with wavelengths of about 1 A, permits the study of the condensed state of matter, solids and liquids, down to atomic resolution. Determination of the atomic structure of crystals, i.e., the arrangement of atoms in a unit cell, is an important example of this line of investigation.

Synchrotron Radiation

SMALL-ANGLE SCATTERING A comprehensive and timely volume covering contemporary research, practical techniques, and theoretical approaches to SAXS and SANS Small-Angle Scattering: Theory, Instrumentation, Data, and Applications provides authoritative coverage of both small-angle X-ray scattering (SAXS), small-angle neutron scattering (SANS) and grazing incidence small-angle scattering (GISAS) including GISAXS and GISANS. This single-volume resource offers readers an up-to-date view of the state of the field, including the theoretical foundations, experimental methods, and practical applications of small-angle scattering (SAS) techniques including laboratory and synchrotron SAXS and reactor/spallation SANS. Organized into six chapters, the text first describes basic theory, instrumentation, and data analysis. The following chapters contain in-depth discussion on various applications of SAXS and SANS and GISAXS and GISANS, and on specific techniques for investigating structure and order in soft materials, biomolecules, and inorganic and magnetic materials. Author Ian Hamley draws from his more than thirty years' experience working with many systems, instruments, and types of small-angle scattering experiments across most European facilities to present the most complete introduction to the field available. This book: Presents uniquely broad coverage of practical and theoretical approaches to SAXS and SANS Includes practical information on instrumentation and data analysis Offers useful examples and an accessible and concise presentation of topics Covers new developments in the techniques of SAXS and SANS, including GISAXS and GISANS Small-Angle Scattering: Theory, Instrumentation, Data, and Applications is a valuable source of detailed information for researchers and postgraduate students in the field, as well as other researchers using X-ray and neutron scattering to investigate soft materials, other nanostructured materials and biomolecules such as proteins.

Cellulose Science and Technology

A practical guide for graduate students and researchers on all aspects of x-ray scattering experiments on liquid surfaces and interfaces.

Quantitative Biology

Light scattering is a very powerful method for characterizing the structure of polymers and nanoparticles in solution. As part of the Springer Laboratory series, this book provides a simple-to-read and illustrative textbook probing the seemingly very complicated topic of light scattering from polymers and nanoparticles in dilute solution, and goes further to cover some of the latest technical developments in experimental light scattering.

Small Angle X-ray Scattering

This volume of Current Topics in Membranes focuses on Membrane Protein Crystallization, beginning with a review of past successes and general trends, then further discussing challenges of mebranes protein crystallization, cell free production of membrane proteins and novel lipids for membrane protein crystallization. This publication also includes tools to enchance membrane protein crystallization, technique advancements, and crystallization strategies used for photosystem I and its complexes, establishing Membrane Protein Crystallization as a needed, practical reference for researchers.

Structure Analysis by Small-Angle X-Ray and Neutron Scattering

Understanding and manipulating the properties of materials naturally occurring in our world and artificially produced by modern technologies requires detailed information on their properties on the atomic scale. This information is the basis for any kind of research in physics, chemistry, biology, engineering, metallurgy, and ceramics. Among the various experimental methods, neutron and photon scattering have become the key techniques of choice. This book provides an overview of the complementarity between neutron and synchrotron x-ray scattering. The most important topics are covered, including structure determination, magnetic correlations, polymer dynamics, thin films and multilayers, photoemission studies, etc; they are thoroughly introduced and discussed by experts from both the experimental and the theoretical side. Contents:Neutron- and Synchrotron X-Ray Scattering (The Theoretical Principles) (W E Fischer)Structure Determination by Powder Synchrotron X-Ray Diffraction (A N Fitch)Magnetic Neutron and Synchrotron X-Ray Scattering (W G Stirling)Magnetic Excitations Through the Eye of the Neutron (W J L Buyers)Topological Excitations in Low-Dimensional Magnets (H B Braun)Elastic and Inelastic X-Ray Scattering from Correlated Electrons: A Theoretical

Perspective (M Altarelli)From Thin Films to Superlattices Studied with X-Rays and Neutrons (D F Mc-Morrow)Small-Angle and Surface Scattering from Porous and Fractal Materials (S K Sinha)Hot Topics in Condensed Matter Physics (H R Ott)Neutron Beam Optics (P Böni)Synchrotron X-Ray Beam Optics (A Freund)Summary Lecture: Some Features of the Scattering and Absorption of Beams of Neutrons and Beams of X-Rays (S W Lovesey)and other papers Readership: Condensed matter and solid state physicists. Keywords:Photon Scattering;Structure Determination;Magnetic Correlations;Polymer Dynamics;Thin Films;Multilayers;Photoemission Studies;Synchrotron X-Ray;Optics;Neutrons

Small-Angle Scattering

The last two decades have seen a number of significant advances in the methodology for evaluating the molecular weight distributions of polydispersed macromolecular systems in solution at the molecular level. This reference presents reviews on the progress in different analytical and characterization methods of biopolymers. Readers will find useful information about combinations of complex biopolymer analysis such as chromatographic or membrane based fractionation procedures combined with multiple detectors on line (multi-angle laser light scattering or MALLS). Key topics include: • refractive index, UV-Vis absorbance and intrinsic viscosity detection systems, • advances in SEC-MALLS (size exclusion chromatography coupled to multi-angle laser light scattering) and FFF-MALLS (field flow fractionation coupled on line to MALLS), • HPSEC-A4F-MALLS, matrix-assisted laser-desorption ionization (MALDI) • electrospray ionization (ESI) mass spectrometry • nuclear magnetic resonance (NMR) spectroscopy This reference is intended for students of applied chemistry and biochemistry who require information about biopolymer analysis and characterization.

Liquid Surfaces and Interfaces

X-ray scattering techniques are a family of nondestructive analytical techniques. Using these techniques, scientists obtain information about the crystal structure and chemical and physical properties of materials. Nowadays, different techniques are based on observing the scattered intensity of an X-ray beam hitting a sample as a function of incident and scattered angle, polarization, and wavelength. This book is intended to give overviews of the relevant X-ray scattering techniques, particularly about inelastic X-ray scattering, elastic scattering, grazing-incidence small-angle X-ray scattering, small-angle X-ray scattering, and high-resolution X-ray diffraction, and, finally, applications of X-ray spectroscopy to study different biological systems.

Light Scattering from Polymer Solutions and Nanoparticle Dispersions

Neutron scattering is an extremely powerful tool in the study of elemental excitations in condensed matter. This book provides a practical guide to basic techniques using a triple-axis spectrometer. Introductory chapters summarize useful scattering formulas and describe the components of a spectrometer, followed by a comprehensive discussion of the resolution function and focusing effects. Later sections include simple examples of phonon and magnon measurements, and an analysis of spurious effects in both inelastic and elastic measurements, and how to avoid them. Finally, polarization analysis techniques and their applications are covered. This guide will allow graduate students and experienced researchers new to neutron scattering to make the most efficient use of their experimental time.

Membrane Protein Crystallization

This MIE volume provides laboratory techniques that aim to predict the structure of a protein which can have tremendous implications ranging from drug design, to cellular pathways and their dynamics, to viral entry into cells. Expert researchers introduce the most advanced technologies and techniques in protein structure and folding Includes techniques on tiling assays

Complementarity Between Neutron and Synchrotron X-Ray Scattering

This book presents a survey of recent developments in protein biochemistry. Top researchers in the field of protein biochemistry describe modern methods to address the challenges of protein purification by three-phase partitioning, and their folding and degradation by the functions of chaperones. The significance of peptide purity for fibril formation is addressed as well as the use of target oriented peptide arrays in palliative approaches in mucoviszidose. The design and application of protein epitope mimetics just as the structural resolving of the misfolding of various mutant proteins in serpinopathies enlarge our tools in resolving pathophysiological imbalances.

Advances in Physicochemical Properties of Biopolymers (Part 1)

Nuclear Magnetic Resonance (NMR) spectroscopy, a physical phenomenon based upon the magnetic properties of certain atomic nuclei, has found a wide range of applications in life sciences over recent decades. The dramatic advances in NMR techniques have led to corresponding advances in the ability of NMR to study structure, dynamics and interactions of biological macromolecules in solution under close to physiological conditions. This volume focuses on the use of NMR to study proteins. NMR can be used to determine detailed three-dimensional structures of proteins in solution. Furthermore, it provides information about conformational or chemical exchange, internal mobility and dynamics at timescales varying from pcoseconds to seconds. It is the primary technique used to obtain information on intrinsically disordered (unfolded) proteins, since these proteins will not crystallize easily. NMR is also a very powerful method for the study of interactions of protein with other molecules, whether small molecules (including drugs), nuclear acids or other proteins. This up-to-date volume covers NMR techiniques and their application to proteins, with a focus on practical details. This book will provide a newcomer to NMR with the practical guidance in order to carry out successful experiments with proteins and to analyze the resulting spectra. Those who are familiar with the chemical applications of NMR will also find is useful in understanding the special requirements of protien NMR.

X-ray Scattering

Neutron Scattering with a Triple-Axis Spectrometer