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CONDENSED MATTER • 13

# Quasielastic Neutron Scattering and Solid State Diffusion

ROLF HEMPELMANN



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# Quasielastic Neutron Scattering And Solid State Diffusion

**Jerry L. Atwood, Jonathan W. Steed**



## **Quasielastic Neutron Scattering And Solid State Diffusion:**

**Quasielastic Neutron Scattering, Principles and Applications in Solid State Chemistry, Biology and Materials Science** Marc Bée, 1988 Written by an author who is widely recognized as one of the specialists of the techniques for the investigation of molecular motions in solids the subject is given a thorough theoretical treatment and is illustrated with numerous examples of recent experimental applications *Quasielastic Neutron Scattering and Solid State Diffusion* Rolf Hempelmann, 2000 Quasielastic neutron scattering has made important contributions to the atomistic elucidation of diffusion processes in solids This book provides information on the potential of quasielastic neutron scattering **Quasielastic Neutron Scattering and Solid State Diffusion** Rolf Hempelmann, 2000 **Single-Chain Polymer Nanoparticles** José A. Pomposo, 2017-08-18 This first book on this important and emerging topic presents an overview of the very latest results obtained in single chain polymer nanoparticles obtained by folding synthetic single polymer chains painting a complete picture from synthesis via characterization to everyday applications The initial chapters describe the synthetic methods as well as the molecular simulation of these nanoparticles while subsequent chapters discuss the analytical techniques that are applied to characterize them including size and structural characterization as well as scattering techniques The final chapters are then devoted to the practical applications in nanomedicine sensing catalysis and several other uses concluding with a look at the future for such nanoparticles Essential reading for polymer and materials scientists materials engineers biochemists as well as environmental chemists *Practical Guide to Quasi-elastic Neutron Scattering* Mark T F Telling, 2020-07-07 The technique of Quasi Elastic Neutron Scattering QENS is a powerful experimental tool for extracting temporal and spatial information at the nanoscale from both soft and hard condensed matter systems However while seemingly simple the method is beset with sensitivities that if ill considered can hinder data interpretation and possibly publication By highlighting key theoretical and data evaluation aspects of the technique this specialised primer style training resource encourages research success by guiding new researchers through a typical QENS experiment from planning and sample preparation considerations to data reduction and subsequent analysis Research examples are referenced throughout to illustrate the concepts addressed with the book being written in such a way that it remains accessible to chemists biologists physicists and materials scientists **Solid State Proton Conductors** Philippe Knauth, Maria Luisa Di Vona, 2012-01-30 Proton conduction can be found in many different solid materials from organic polymers at room temperature to inorganic oxides at high temperature Solid state proton conductors are of central interest for many technological innovations including hydrogen and humidity sensors membranes for water electrolyzers and most importantly for high efficiency electrochemical energy conversion in fuel cells Focusing on fundamentals and physico chemical properties of solid state proton conductors topics covered include Morphology and Structure of Solid Acids Diffusion in Solid Proton Conductors by Nuclear Magnetic Resonance Spectroscopy Structure and Diffusivity by Quasielastic Neutron Scattering

Broadband Dielectric Spectroscopy Mechanical and Dynamic Mechanical Analysis of Proton Conducting Polymers Ab initio Modeling of Transport and Structure Perfluorinated Sulfonic Acids Proton Conducting Aromatic Polymers Inorganic Solid Proton Conductors Uniquely combining both organic polymeric and inorganic proton conductors Solid State Proton Conductors Properties and Applications in Fuel Cells provides a complete treatment of research on proton conducting materials     **Diffusion in Solids** Helmut Mehrer, 2007-07-24 Diffusion is a vital topic in solid state physics and chemistry physical metallurgy and materials science Diffusion processes are ubiquitous in solids at elevated temperatures A thorough understanding of diffusion in materials is crucial for materials development and engineering This book first gives an account of the central aspects of diffusion in solids for which the necessary background is a course in solid state physics It then provides easy access to important information about diffusion in metals alloys semiconductors ion conducting materials glasses and nanomaterials Several diffusion controlled phenomena including ionic conduction grain boundary and dislocation pipe diffusion are considered as well Graduate students in solid state physics physical metallurgy materials science physical and inorganic chemistry or geophysics will benefit from this book as will physicists chemists metallurgists materials engineers in academic and industrial research laboratories     *Solid State Proton Conductors* Philippe Knauth, Maria Luisa Di Vona, 2012-01-18 Proton conduction can be found in many different solid materials from organic polymers at room temperature to inorganic oxides at high temperature Solid state proton conductors are of central interest for many technological innovations including hydrogen and humidity sensors membranes for water electrolyzers and most importantly for high efficiency electrochemical energy conversion in fuel cells Focusing on fundamentals and physico chemical properties of solid state proton conductors topics covered include Morphology and Structure of Solid Acids Diffusion in Solid Proton Conductors by Nuclear Magnetic Resonance Spectroscopy Structure and Diffusivity by Quasielastic Neutron Scattering Broadband Dielectric Spectroscopy Mechanical and Dynamic Mechanical Analysis of Proton Conducting Polymers Ab initio Modeling of Transport and Structure Perfluorinated Sulfonic Acids Proton Conducting Aromatic Polymers Inorganic Solid Proton Conductors Uniquely combining both organic polymeric and inorganic proton conductors Solid State Proton Conductors Properties and Applications in Fuel Cells provides a complete treatment of research on proton conducting materials     *Quasicrystals* Hans-Rainer Trebin, 2006-05-12 Quasicrystals form a new state of solid matter beside the crystalline and the amorphous The positions of the atoms are ordered but with noncrystallographic rotational symmetries and in a nonperiodic way The new structure induces unusual physical properties promising interesting applications This book provides a comprehensive and up to date review and presents most recent research results achieved by a collaboration of physicists chemists material scientists and mathematicians within the Priority Programme Quasicrystals Structure and Physical Properties of the Deutsche Forschungsgemeinschaft DFG Starting from metallurgy synthesis and characterization the authors carry on with structure and mathematical modelling On this basis electronic magnetic thermal dynamic and

mechanical properties are dealt with and finally surfaces and thin films

**Experimental Neutron Scattering** B. T. M. Willis, C. J. Carlile, 2017-03-23 The first systematic experiments in neutron scattering were carried out in the late 1940s using fission reactors built for the nuclear power programme Crystallographers were amongst the first to exploit the new technique but they were soon followed by condensed matter physicists and chemists Engineers and biologists are the most recent recruits to the club of neutron users The aim of the book is to provide a broad survey of the experimental activities of all these users There are many specialist monographs describing particular examples of the application of neutron scattering fifteen of such monographs have been published already in the Oxford University Press series edited by S Lovesey and E Mitchell However this book will appeal to newcomers to the field of neutron scattering who may be intimidated by the bewildering array of instruments at central facilities such as the Institut Laue Langevin in France the ISIS Laboratory in the UK or the PSI Laboratory in Switzerland and who may be uncertain as to which instrument to use

*Neutron Scattering in Biology* Jörg Fitter, Thomas Gutberlet, 2006-01-10 The advent of new neutron facilities and the improvement of existing sources and instruments world wide supply the biological community with many new opportunities in the areas of structural biology and biological physics The present volume offers a clear description of the various neutron scattering techniques currently being used to answer biologically relevant questions Their utility is illustrated through examples by some of the leading researchers in the field of neutron scattering This volume will be a reference for researchers and a step by step guide for young scientists entering the field and the advanced graduate student

*Diffusion in Condensed Matter* Paul Heitjans, Jörg Kärger, 2006-01-16 This comprehensive handbook style survey of diffusion in condensed matter gives detailed insight into diffusion as the process of particle transport due to stochastic movement It is understood and presented as a phenomenon of crucial relevance for a large variety of processes and materials In this book all aspects of the theoretical fundamentals experimental techniques highlights of current developments and results for solids liquids and interfaces are presented

**Diffusion in Nanoporous Materials, 2 Volumes** Jörg Kärger, Douglas M. Ruthven, Doros N. Theodorou, 2012-10-29 Atoms and molecules in all states of matter are subject to continuous irregular movement This process referred to as diffusion is among the most general and basic phenomena in nature and determines the performance of many technological processes This book provides an introduction to the fascinating world of diffusion in microporous solids Jointly written by three well known researchers in this field it presents a coherent treatise rather than a compilation of separate review articles covering the theoretical fundamentals molecular modeling experimental observation and technical applications Based on the book *Diffusion in Zeolites and other Microporous Solids* originally published in 1992 it illustrates the remarkable speed with which this field has developed since that time Specific topics include new families of nanoporous materials micro imaging and single particle tracking direct monitoring of transient profiles by interference microscopy single file diffusion and new approaches to molecular modeling

Neutron and X-ray Spectroscopy Françoise Hippert, Erik

Geissler, Jean Louis Hodeau, Eddy Lelièvre-Berna, Jean-René Regnard, 2005-12-13 Up to date account of the principles and practice of inelastic and spectroscopic methods available at neutron and synchrotron sources Multi technique approach set around a central theme rather than a monograph on one technique Emphasis on the complementarity of neutron spectroscopy and X ray spectroscopy which are usually treated in separate books Diffuse Neutron Scattering from Crystalline Materials Victoria M. Nield, David A. Keen, 2001 The present book is an accessible comprehensive guide to diffuse neutron scattering an important technique for studying structural disorder in materials The text takes the reader through theoretical computational and experimental developments in the subject and describes in detail its application to a number of structural disorder problems These include the more traditional subjects of substitutional disorder in alloys and orientational disorder in molecular systems as well as the more recent studies of superionic and framework materials Particular emphasis is placed on recent refinement methods for data interpretation which are compared with established computer simulation techniques and analytical approaches The book collects disparate themes into one unique volume written as an introduction to the method for graduate scientists It will be a valuable reference text for any crystallographer keen to understand and apply modern interpretative techniques to diffuse scattering data **Neutron Spin Echo in Polymer Systems** Dieter Richter, M. Monkenbusch, Arantxa Arbe, Juan Colmenero, 2005-03-31 **Magnetic Small-Angle Neutron Scattering** Andreas Michels, 2021 The book presents the first extensive treatment of magnetic small angle neutron scattering SANS enabling advanced students and researchers to make efficient use of the method and to analyze and interpret their SANS experiments **Solid-State NMR I Methods** B. Blümich, 2012-12-06 1 A R Grimmer Berlin FRG B Bl mich Aachen FRG Introduction to Solid State NMR 2 F Laupretre Paris France High Resolution 13C NMR Investigations of Local Dynamics in Bulk Polymers at Temperatures Below and Above the Glass Transition Temperature 3 D Raftery Philadelphia PA B F Chmelka Santa Barbara CA Xenon NMR Spectroscopy 4 G Fleischer Leipzig FRG F Fujara Mainz FRG NMR as a Generalized Incoherent Scattering Experiment 5 P Bl mler B Bl mich Mainz FRG NMR Imaging of Solids **Neutron Scattering in Earth Sciences** Hans Rudolf Wenk, 2018-12-17 Volume 63 of Reviews in Mineralogy and Geochemistry provides an introduction for those not yet familiar with neutrons by describing basic features of neutrons and their interaction with matter as well illustrating important applications The volume is divided into 17 Chapters The first two chapters introduce properties of neutrons and neutron facilities setting the stage for applications Some applications rely on single crystals Chapter 3 but mostly powders Chapters 4 5 and bulk polycrystals Chapters 15 16 are analyzed at ambient conditions as well as low and high temperature and high pressure Chapters 7 9 Characterization of magnetic structures remains a core application of neutron scattering Chapter 6 The analysis of neutron data is not trivial and crystallographic methods have been modified to take account of the complexities such as the Rietveld technique Chapter 4 and the pair distribution function Chapter 11 Information is not only obtained about solids but about liquids melts and aqueous solutions as well Chapters 11

13 In fact this field approached with inelastic scattering Chapter 10 and small angle scattering Chapter 13 is opening unprecedented opportunities for earth sciences Small angle scattering also contributes information about microstructures Chapter 14 Neutron diffraction has become a favorite method to quantify residual stresses in deformed materials Chapter 16 as well as preferred orientation patterns Chapter 15 The volume concludes with a short introduction into neutron tomography and radiography that may well emerge as a principal application of neutron scattering in the future Chapter 17

**Encyclopedia of Supramolecular Chemistry - Two-Volume Set (Print)** Jerry L. Atwood,Jonathan W. Steed,2013-10-09 The two volume Encyclopedia of Supramolecular Chemistry offers authoritative centralized information on a rapidly expanding interdisciplinary field User friendly and high quality articles parse the latest supramolecular advancements and methods in the areas of chemistry biochemistry biology environmental and materials science and engineering physics computer science and applied mathematics Designed for specialists and students alike the set covers the fundamentals of supramolecular chemistry and sets the standard for relevant future research

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