Water in Biological and Chemical Processes Because of the importance of the hydrogen bond, there have been scores of insights gained about its fundamental nature by quantum chemical computations over the years. Such methods can probe subtle characteristics of the electronic structure and examine regions of the potential energy surface that are simply not accessible by experimental means. The maturation of the techniques, codes, and computer hardware have permitted calculations of unprecedented reliability and rivaling the accuracy of experimental data. This book strives first toward an appreciation of the power of quantum chemistry to analyze the deepest roots of the hydrogen bond phenomenon. It offers a systematic and understandable account of decades of such calculations, focusing on the most important findings. This book provides readers with the tools to understand the original literature, and to perhaps carry out some calculations of their very own on systems of interest.

Hydrogen Bonding in Biological Structures Inelastic neutron scattering (INS) is a spectroscopic technique in which neutrons are used to probe the dynamics of atoms and molecules in solids and liquids. This book is the first, since the late 1960s, to cover the principles and applications of INS as a vibrational-spectroscopic technique. It provides a hands-on account of the use of INS, concentrating on how neutron vibrational spectroscopy can be employed to obtain chemical information on a range of materials that are of interest to chemists, biologists, materials scientists, surface scientists and catalyst researchers. This is an accessible and comprehensive single-volume primary text and reference source. Contents: The Theory of Inelastic Neutron Scattering Spectroscopy Instrumentation and Experimental Methods Interpretation and Analysis of Spectra Using Molecular Modelling Analysis of INS Spectra Dihydrogen and Hydrides Surface Chemistry and Catalysis Organic and Organometallic Compounds Hydrogen Bonding Soft Condensed Matter — Polymers and Biomaterials Non-Hydrogenous Materials and Carbon Vibrational Spectroscopy with Neutrons Non-Covalent Catalysis and Hydrogen Bonding

Hydrogen Bonding in Organic Synthesis

Hydrogen Bonding This book documents the proceedings of the symposium "Fundamentals and Applications of Anion Separations" held during American Chemical Society National Meeting in Chicago, Illinois, August 25-30, 2001. Nearly 40 papers devoted to discussions on anion separation related to fundamental research and applications were presented. The symposium, sponsored by Osram Sylvania, BetzDearborn, and the Separation Science & Technology Subdivision of the Industrial & Engineering Chemistry Division of the American Chemical Society was organized by Bruce A. Moyer, Chemical Sciences Division, Oak Ridge National Laboratory, P.O. Box 2008, Building 45005, Oak Ridge, TN 37831-6119, and Raj P. Singh, Chemicals and Powders R&D, Osram Sylvania, Chemical and Metallurgical Products Division, Towanda, PA 18848. It drew presenters from Australia, the Czech Republic, France, Germany, Japan, South Africa, Thailand, the United Kingdom, and the United States. Separations constitute an integral part of chemical industry. Chemical products typically originate in resources that must be concentrated and purified, chemically transformed, and subjected to final purification. Effluent streams from the processes must be treated to recycle reusable components and to remove environmentally harmful species. Some industrial processes are devoted to environmental cleanup after pollution has occurred. In addition, many analytical methods require a separation for preconcentration, or a separation may be an inherent part of the analysis itself. Micro separations occurring at membranes or interfaces are also related phenomena employed for ion sensing. Many species targeted for separation are naturally anionic. Although the standard separations techniques of extraction, ion exchange, adsorption, precipitation, etc.

Recent Advances in Organic Catalysis The water molecule, H2O, is one of the most familiar molecules, yet it is considered a molecule with almost no interest and which can be consequently ignored. The aim of this book is to present our present view of this molecule, in the hope that it is no longer ignored where it intervenes, and also to show what we still have to learn about it.

Models for Bonding in Chemistry A readable little book assisting the student in understanding, in a nonmathematical way, the essentials of the different bonds occurring in chemistry. Starting with a short, self-contained, introduction, Chapter 1 presents the essential elements of the variation approach to either total or second-order molecular energies, the system of atomic units (au) necessary to simplify all mathematical expressions, and an introductory description of the electron distribution in molecules. Using mostly 2x2 Hückel secular equations, Chapter 2, by far the largest part of the book because of the many implications of the chemical bond, introduces a model of bonding in homonuclear and heteronuclear diatomics, multiple and delocalized bonds in hydrocarbons, and the stereochemistry of chemical bonds in polyatomic molecules, in a word, a model of the strong first-order interactions originating the chemical bond. In Chapter 3 the Hückel model of the linear polyene chain is used to explain the origin of bond structure in the 1-dimensional crystal. Chapter 4 deals with a simple two-state model of weak interactions, introducing the reader to understand second-order electric properties of molecules and VdW bonding between closed shells. Lastly, Chapter 5 studies the structure of H-bonded dimers and the nature of the hydrogen bond, which has a strength intermediate between a VdW bond and a weak chemical bond. Besides a qualitative MO approach based on HOMO-LUMO charge transfer from an electron donor to an electron acceptor molecule, a quantitative electrostatic approach is presented yielding an electrostatic model working even at its simplest pictorial level. A list of alphabetically ordered references, author and subject indices complete the book.

Analysis of Hydrogen Bonds in Crystals This book gives an extensive description of the state-of-the-art in research on excited-state hydrogen bonding and hydrogen transfer in recent years. Initial chapters present both the experimental and theoretical investigations on the excited-state hydrogen bonding structures and dynamics of many organic and biological chromophores. Following this, several chapters describe the influences of the excited-state hydrogen bonding on various photophysical processes and photochemical reactions, for example: hydrogen bonding effects on fluorescence emission behaviors and photoisomerization; the role of hydrogen bonding in photosynthetic water splitting; photoinduced electron transfer and solvation dynamics in room temperature ionic liquids; and hydrogen bonding barrier crossing dynamics at bio-mimicking surfaces. Finally, the book examines experimental and theoretical studies on the nature and control of excited-state hydrogen transfer in various systems.

Hydrogen Bonding and Transfer in the Excited State is an essential overview of this increasingly important field of study, surveying the entire field over 2 volumes, 40 chapters and 1200 pages. It will find a place on the bookshelves of researchers in photochemistry, photobiology, photophysics, physical chemistry and chemical physics.
articles and the knowledge newcomers to the field are looking for, this is a timely and comprehensive monograph covering the interdisciplinary topic of intramolecular charge transfer (ICT). The book not only covers the fundamentals and physico-chemical background of the ICT process, but also places a special emphasis on the latest experimental and theoretical studies that have been undertaken to understand this process and discusses key technological applications. After outlining the discovery of ICT molecules, the authors go on to discuss several important substance classes. They present the latest techniques for studying the underlying processes and show the interplay between charge transfer and the surrounding medium. Examples taken from nonlinear optics, viscosity and polarity sensors, and organic electronics testify to the vast range of applications. The result is a unique information source for experimentalists as well as theoreticians, from postgraduate students to researchers.

Understanding Hydrogen Bonds This book uses examples from experimental studies to illustrate theoretical investigations, allowing greater understanding of hydrogen bonding phenomena. The most important topics in recent studies are covered. This volume is an invaluable resource that will be of particular interest to physical and theoretical chemists, spectroscopists, crystallographers and those involved with chemical physics.

Hydrogen Bonding - New Insights A unified overview of the dynamical properties of water and its unique and diverse role in biological and chemical processes.


Theoretical Treatments of Hydrogen Bonding The replacement of hydrogen with fluorine in organic molecules can profoundly influence their chemical and physical properties, leading to a range of compounds with highly desirable properties. These molecules are of interest across the wide spectrum of industrial and academic organic chemistry, so that organofluorine chemistry is economically highly important. Organofluorine Chemistry will help chemists to develop systematic knowledge of the chemistry of fluorine with a view towards its application in the design of new reactions and syntheses, and the creation of novel fluorinated molecules and materials. With initial chapters focusing on why fluorine creates such unique properties inorganic compounds, the book then covers general reactions of fluorine. Coverage is chosen from the recent research literature, concentrating on the development of...
novel bioactive compounds and catalytic ligands, and explaining, in the context of the initial chapters, how and why fluorine is so effective. With a final chapter covering the general synthetic chemistry of organofluorine compounds, the book is a cohesive summary of the fundamental principles of organofluorine chemistry.

Modeling the Hydrogen Bond Computational methods, and in particular quantum chemistry, have taken the lead in our growing understanding of noncovalent forces, as well as in their categorization. This volume describes the current state of the art in terms of what we now know, and the current questions requiring answers in the future. Topics range from very strong (ionic) to very weak (CH···?) interactions. In the intermediate regime, forces to be considered are H-bonds, particularly CH--O and OH--metal, halogen, chalcogen, pnictogen and tetrrel bonds, aromatic stacking, dihydrogen bonds, and those involving radicals. Applications include drug development and predictions of crystal structure.

A New Introduction to Hydrogen Bonding Hydrogen bonded systems play an important role in all aspects of science but particularly chemistry and biology. Notably, the helical structure of DNA is heavily reliant on the hydrogen bonds between the DNA base pairs. Although the area of hydrogen bonding is one that is well established, our understanding has continued to develop as the power of both computational and experimental techniques has improved. Understanding Hydrogen Bonds presents an up-to-date overview of our theoretical and experimental understanding of the hydrogen bond. Well-established and novel approaches are discussed, including quantum theory of ‘atoms in molecules’ (QTAIM); the electron localization function (ELF) method and Car–Parinnello molecular dynamics; the natural bond orbital (NBO) approach; and X-ray and neutron diffraction and spectroscopy. The mechanism of hydrogen bond formation is described and comparisons are made between hydrogen bonds and other types of interaction. The author also takes a look at new types of interaction that may be classified as hydrogen bonds with a focus on those with multicentre proton acceptors or with multicentre proton donors. Understanding Hydrogen Bonds is a valuable reference for experimentalists and theoreticians interested in updating their understanding of the types of hydrogen bonds, their role in chemistry and biology, and how they can be studied.

Organofluorine Chemistry This book is a printed edition of the Special Issue "Analysis of Hydrogen Bonds in Crystals" that was published in Crystals

Fundamentals and Applications of Anion Separations A Top 25 CHOICE 2016 Title, and recipient of the CHOICE Outstanding Academic Title (OAT) Award. How much energy is released in ATP hydrolysis? How many mRNAs are in a cell? How genetically similar are two random people? What is faster, transcription or translation? Cell Biology by the Numbers explores these questions and dozens of others provid

Concepts of Biology The study of intermolecular forces began over one hundred years ago in 1873 with the famous thesis of van der Waals. In recent decades, knowledge of this field has expanded due to intensive research into both its theoretical and the experimental aspects. This is particularly true for the type of very strong cohesive force stressed in 1920 by Latimer and Rodebush: the hydrogen bond, a phenomenon already outlined in 1912 by Moore and Winemill. Hydrogen bonds exert a profound influence on most of the physical and chemical properties of the materials in which they are formed. Not only do they govern viscosity and electrical conductivity, they also intervene in the chemical reaction pathway which determines the kinetics of chemical processes. The properties of chemical substances depend to a large extent on intermolecular forces. In spite of this fundamental fact, too little attention is given to these properties both in research and in university teaching. For instance, in the field of pharmaceutical research, about 13000 compounds need to be studied in order to find a single new product that can be successfully marketed. The recognition of the need to optimize industrial research efficiency has led to a growing interest in promoting the study of intermolecular forces. Rising salary costs in industry have encouraged an interest in theoretical ideas which will lead to tailor made materials.

The Limits of Organic Life in Planetary Systems The existence of the weak hydrogen bond has been postulated for some years, but only recently has it become evident that the bond plays a distinctive role in the characteristics of certain molecules. This book provides a critical assessment.

The Electronic Theory of Valency This profusely illustrated book, by a world-renowned chemist and award-winning chemistry teacher, provides science students with an introduction to atomic and molecular structure and bonding. (This is a reprint of a book first published by Benjamin/Cummings, 1973.)
Hydrogen Bonding

This book is intended as an easy to read supplement to the often brief descriptions of hydrogen bonding found in most undergraduate chemistry and molecular biology textbooks. It describes and discusses current ideas concerning hydrogen bonds ranging from the very strong to the very weak, with introductions to the experimental and theoretical methods involved.

Noncovalent Forces

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Water and Life

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

Intramolecular Charge Transfer

Hydrogen bond (H-bond) effects are known: it makes sea water liquid, joins cellulose microfibrils in trees, shapes DNA into genes and polypeptide chains into wool, hair, muscles or enzymes. Its true nature is less known and we may still wonder why O-HO bond energies range from less than 1 to more than 30 kcal/mol without apparent reason. This H-bond puzzle is re-examined here from its very beginning and presented as an inclusive compilation of experimental H-bond energies and geometries. New concepts emerge from this analysis: new classes of systematically strong H-bonds (CAHBs and RAHBs: charge- and resonance-assisted H-bonds); full H-bond classification in six classes (the six chemical leitmotifs); and assessment of the covalent nature of strong H-bonds. This leads to three distinct but inter-consistent models able to rationalize the H-bond and predict its strength, based on classical VB theory, matching of donor-acceptor acid-base parameters (PA or pKa), or shape of the H-bond proton-transfer pathway. A applications survey a number of systems where strong H-bonds play an important functional role, namely drug-receptor binding, enzymatic catalysis, ion-transport through cell membranes, crystal design and molecular mechanisms of functional materials.
enzyme chemistry, organocatalysis and total synthesis, all unified by the unique advantages of hydrogen bonding in the construction of complex molecules from simple precursors. Providing everything you need to know, this is a definite must for every synthetic chemist in academia and industry.

Hydrogen Bonding and Transfer in the Excited State Hydrogen Bonding covers the papers presented at the Symposium on Hydrogen Bonding, held at Ljubljana on July 29 to August 3, 1957. The book focuses on the developments, processes, approaches, methodologies, and reactions involved in hydrogen bonding. The selection first offers information on the structure of water; function of hydrogen bond in solids and liquids; and study of hydrogen bonds by neutron diffraction. The text then takes a look at x-ray and neutron studies of hydrogen bonding; x-ray studies of ammonium bifluoride, potassium hydrogen maleate, theophylline, and caffeine; and isotope effect in relation to bond length in hydrogen bonds in crystals. The publication ponders on proton magnetic resonance measurements of hydrogen bonding; interpretation of nuclear magnetic resonance shifts in hydrogen bonding; nuclear resonance investigation of hydrogen bonding; and infrared spectroscopy and hydrogen bonding — band-widths and frequency shifts. The book then examines the tunneling of protons as a cause of the splitting of hydroxyl stretching bands; infrared spectroscopic study of H-bonding and of metal-element bonding; and effect of hydrogen bond formation on the electronic spectra of phenolic substances. The selection is a vital source of information for readers interested in hydrogen bonding.

An Introduction to Hydrogen Bonding Reflecting a rich technical and interdisciplinary exchange of ideas, Water and Life: The Unique Properties of H2O focuses on the properties of water and its interaction with life. The book develops a variety of approaches that help to illuminate ways in which to address deeper questions with respect to the nature of the universe and our place within it. Grouped in five broad parts, this collection examines the arguments of Lawrence J. Henderson and other scholars on the "fitness" of water for life as part of the physical and chemical properties of nature considered as a foundational environment within which life has emerged and evolved. Leading authorities delve into a range of themes and questions that span key areas of ongoing debate and uncertainty. They draw from the fields of chemistry, biology, biochemistry, planetary and earth sciences, physics, astronomy, and their subspecialties. Several chapters also deal with humanistic disciplines, such as the history of science and theology, to provide additional perspectives. Bringing together highly esteemed researchers from multidisciplinary fields, this volume addresses fundamental questions relating to the possible role of water in the origin of life in the cosmos. It supports readers in their own explorations of the origin and meaning of life and the role of water in maintaining life.

The Weak Hydrogen Bond The search for life in the solar system and beyond has to date been governed by a model based on what we know about life on Earth (terran life). Most of NASA’s mission planning is focused on locations where liquid water is possible and emphasizes searches for structures that resemble cells in terran organisms. It is possible, however, that life exists that is based on chemical reactions that do not involve carbon compounds, that occurs in solvents other than water, or that involves oxidation-reduction reactions without oxygen gas. To assist NASA incorporate this possibility in its efforts to search for life, the NRC was asked to carry out a study to evaluate whether nonstandard biochemistry might support life in solar system and conceivable extrasolar environments, and to define areas to guide research in this area. This book presents an exploration of a limited set of hypothetical chemistries of life, a review of current knowledge concerning key questions or hypotheses about nonterran life, and suggestions for future research.

Cellulose This book leaves the conventional view of chemical structures far behind: it demonstrates how a wealth of valuable, but hitherto unused information can be extracted from available structural data. For example, a single structure determination does not reveal much about a reaction pathway, but a sufficiently large number of comparable structures does. Finding the 'right' question is as important as is the intelligent use of crystallographic databases. Contributions by F.H. Allen, T.L. Blundell, I.D. Brown, H.B. Bürgi, J.D. Dunitz, L. Leiserowitz and others, authoritatively discuss the structure correlation method as well as illustrative results in detail, covering such apparently unrelated subjects as * Bond strength relations in solids * Crystal structure prediction * Reaction pathways of organic molecules * Ligand/receptor interactions and enzyme mechanisms This book will be useful to the academic and industrial reader alike. It offers both fundamental aspects and diverse applications of what will surely become a powerful branch of structural chemistry.

Hydrogen Bonding in Organic Synthesis Hydrogen bonds are weak attractions, with a binding strength less than one-tenth that of a normal covalent bond. However, hydrogen bonds are of extraordinary
importance: without them all wooden structures would collapse, cement would crumble, oceans would vaporize, and all living things would disintegrate into random dispersions of inert matter. Hydrogen Bonding in Biological Structures is informative and eminently usable. It is, in a sense, a Rosetta stone that unlocks a wealth of information from the language of crystallography and makes it accessible to all scientists. (From a book review of Kenneth M. Harmon, Science 1992)

The Hydrogen Bond and the Water Molecule This first comprehensive overview of the rapidly growing field emphasizes the use of hydrogen bonding as a tool for organic synthesis, especially catalysis. As such, it covers such topics as enzyme chemistry, organocatalysis and total synthesis, all unified by the unique advantages of hydrogen bonding in the construction of complex molecules from simple precursors. Providing everything you need to know, this is a definite must for every synthetic chemist in academia and industry.

Advances in Chromatography Discusses theoretical methods, molecular modeling, and graphical analyses as applied to the study of hydrogen bonding in small organic molecules, bioorganic molecules including sugars in solution and as crystals, and synthetic and biopolymers. Explores the interrelationship between solvent and hydrogen bonding and the effects of hydrogen bonding on molecular electrostatic potential.

Intermolecular Forces

The Hydrogen Bond Cellulose is destined to play a major role in the emerging bioeconomy. Awareness of the environment and a depletion of fossil fuels are some of the driving forces for looking at forest biomaterials for an alternative source of energy, chemicals and materials. The importance of cellulose is widely recognized world-wide and as such the field of cellulose science is expanding exponentially. Cellulose, the most abundant biopolymer on earth, has unique properties which makes it an ideal starting point for transforming it into useful materials. To achieve this, a solid knowledge of cellulose is essential. As such this book on cellulose, the first in a series of three, is very timely. It deals with fundamental aspect of cellulose, giving the reader a good appreciation of the richness of cellulose properties. Book Cellulose - Fundamental Aspects is a good introduction to books Cellulose - Medical, Pharmaceutical and Electronic Applications and Cellulose - Biomass Conversion, in which applications of cellulose and its conversion to other materials are treated.

The Nature of the Hydrogen Bond Research Paper (undergraduate) from the year 2019 in the subject Chemistry - Bio-chemistry, grade: 1,0, University of Cologne, language: English, abstract: This work is about the non-covalent catalysis and concentrates on the hydrogen-bond catalysis. Nowadays it is common to use catalysis in organic synthesis. It can help in orienting the substrates, lowering barriers to reaction and accelerating the rates of reaction. In addition to metal-ligand systems and biocatalysts, there is another class of catalysts, the organocatalysts which are free of any metals, like many enzymes. The organocatalysts often consist of chiral compounds. The output materials are easy to find in the nature. How these catalysts accelerate the reaction rates is a central question in organic synthesis. It is important to distinguish the interactions with the organic substrates between covalent and non-covalent bonds. The activation of a carbonyl compound by conversion into an enamine or into an iminium ion belongs to the covalent catalysis, while to increase the electrophilicity of a carbonyl group by formation of hydrogen bondings is a typical example for non-covalent organocatalysis. Thus, the acceleration and the control of the reaction rates depend on formation of hydrogen bonds for non-covalent organocatalysis. It is possible to catalyse two hydrogen bonds which occur in dual hydrogen bonding donors.

Structure Correlation The author illustrates why the rather weak hydrogen bond is so essential for our everyday life in a lively and entertaining way. The chemical and physical fundamentals are explained with examples ranging from the nature of water over the secret of DNA to adhesives and modern detergents. The interdisciplinary science is easy to understand and hence a great introduction for chemists, biologists and physicists.

Physics of Ice Hydrogen bonds range from the very strong, comparable with covalent bonds, to the very weak, comparable with van der Waals forces. Most hydrogen bonds are weak attractions with a binding strength about one-tenth of that of a normal covalent bond. Nevertheless, they are very important. Without them, all wooden structures would collapse, cement would crumble, oceans would vaporize, and all living things would disintegrate into inanimate matter. A n easy-to-read supplement to the often brief descriptions of hydrogen bonding found in most undergraduate chemistry and molecular biology
textbooks, An Introduction to Hydrogen Bonding describes and discusses the current ideas concerning hydrogen bonding, ranging from the very strong to the very weak, with introductions to the experimental and theoretical methods involved. Ideal for courses in chemistry and biochemistry, it will also be useful for structural biology and crystallography courses. For students and researchers interested in supramolecular chemistry, biological structure and recognition, and other sophisticated concepts and methodologies, it provides a careful selection of key references from the vast hydrogen bonding literature.

Introduction to Intermolecular Forces. Hydrogen Bonding

Hydrogen Bonding in Polymeric Materials Illustrating developments in separation science and chromatographic analysis, this volume investigates trends in chemometrics, proteomics, column technology, and element-selective detection for pharmaceutical, medical, industrial and environmental applications.

Vibrational Spectroscopy with Neutrons Hydrogen bonding is crucial in many chemical and biochemical reactions, as well as in determining material properties. A good insight into the theoretical methods of treating hydrogen bonding is essential for those wishing to model its effects computationally in a wide range of fields involving hydrogen bonding, as well as those wishing to extract the maximal amount of information from experimental data. Theoretical Treatments of Hydrogen Bonding presents the reader with the state of the art of the key theoretical approaches to hydrogen bonding and considers the hydrogen bond from the various aspects. The first five chapters are devoted to the methods used for treating the electronic basis of hydrogen bonding, including a consideration of the electrostatic model, density functional theory and molecular orbital methods. Later chapters consider the dynamics of hydrogen bonds with particular attention to the treatment of proton transfer; manifestations of dynamics as reflected in infrared spectra and nuclear magnetic relaxation are also considered. Hydrogen bonding in liquids and solids such as ferroelectrics are included. The book concludes with an epilogue which discusses the likely development of hydrogen bond computations in very large chemical systems. Theoretical Treatments of Hydrogen Bonding offers the reader a comprehensive view of the current theoretical approaches to hydrogen bonding. It is a valuable presentation of theoretical tools useful to those looking for the most appropriate approach for treating a particular problem involving hydrogen bonding.

Non-Covalent Catalysis and Hydrogen Bonding Ice is one of the most abundant and environmentally important materials on Earth, and its unique and intriguing physical properties present fascinating areas of study for a wide variety of researchers. This book is about the physics of ice, by which is meant the properties of the material itself and the ways in which these properties are interpreted in terms of water molecules and crystalline structure. Although ice has a simple crystal structure its hydrogen bonding results in unique properties, which continue to be the subject of active research. In this book the physical principles underlying the properties of ice are carefully developed at a level aimed at pure and applied researchers in the field. Important topics like current understandings of the electrical, mechanical, and surface properties, and the occurrence of many different crystalline phases are developed in a coherent way for the first time. An extensive reference list and numerous illustrations add to the usefulness and readability of the text.

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