

# WATER

The background of the cover is a high-speed photograph of a water splash, creating a dynamic and textured blue surface. The splash is captured in a way that shows individual water droplets and the intricate patterns of the liquid's movement. The color is a deep, vibrant blue, with lighter areas where the water is more turbulent and darker areas in the shadows of the splash.

## Molecular Structure and Properties

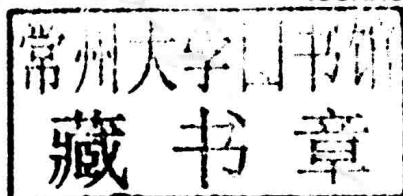
Xiao Feng Pang

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## Molecular Structure and Properties

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Technology of China



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# **WATER**

Molecular Structure  
and Properties



## Preface

This book presents a complete review of water science and responds systematically to “what is water” right from the evolution of the theory of molecular structure of water to its verification by experimental results of infrared spectra of absorption, measurement of energy spectrum of vibration, success in self-assembly of water molecules, and numerical simulation of structure of water. The new theory exhibits that water is composed of free water molecules and their clusters with different weights and configurations including linear and ring chains, which are formed by virtue of various hydrogen bonds. Thus, water is not a uniform but non-uniform liquid. Just so, water has a great number of singular and anomalous properties, which involves the anomalies of mechanical, thermodynamic, electromagnetic, optic and quantum features as well as rheology and flow properties. These anomalous properties also provided the experimental evidence for the new theory. On the other hand, there are various non-linear excitations of KdV, Kink, non-propagated solitary waves, vortex movement and turbulence in water. The behaviors of the non-linear excitations are discussed and their corresponding theories are described in detail. At the same time, water can be magnetized in a magnetic field only when the correct method of magnetization is used. The properties and magnetism of magnetized water are thus gained and confirmed, and a corresponding theory of magnetization, which shows that water can be magnetized in a magnetic field, is given and built. The wide applications of magnetized water in biology/medicine, industry and agriculture are presented simultaneously. Certainly, a complete book on water science cannot forget to mention the close relation of water with life and life activity. In the final chapter, we annotate, explain and elucidate in detail the relation of water with life and life activity, namely, without water there would be no life, life activity, proliferation and development of cell, blood flow, forms of three-dimensional structures of biomacromolecules of protein, DNA or enzymes. Therefore, water with life and life activity are closely related to each other.

## **The Book**

Water is the most extraordinary liquid that is transparent, odorless, tasteless and ubiquitous. Water molecule ( $\text{H}_2\text{O}$ ) is the second most common molecule in the Universe (behind hydrogen,  $\text{H}_2$ ), and is composed of the two most common reactive elements, the hydrogen and oxygen atoms. Therefore, the water molecule is a very small or a light molecule. Although water has only the simple structure, it is most widely used. We drink it, wash and swim in it, and cook with it; without it, we would die within a few days. Droughts cause famines and floods cause death and disease. Liquid water has importance as a solvent, a solute, a reactant and a biomolecule, structuring proteins, nucleic acids, cells and controlling our consciousness. In the meanwhile, water makes up over about half of us and the most abundant solid material and fundamental to start formation. There is a hundred times as many water molecules in our bodies as the sum of all the other molecules. Life cannot evolve or continue, or in other words, everything is nothing without water. Thus, we say that water plays a central role in many of the human activities. However, we nearly always overlook deep researches in the structure and properties of water and the special relationship it has with our lives. As a matter of fact, water has a complicated structure of molecules and a large number of singular and anomalous properties, which are not completely clear and known up to now, even though these problems have been investigated for over several hundreds of years. Therefore, it is necessary to summarize, review and develop our knowledge of water science further.

In retrospect, we have studied the molecular structure of water and its properties for more than 10 years, publishing plenty of articles at home and abroad. This book is a summary and review of our research results, in which a great number of results obtained by other scientists in last hundred years are included and commented.

In summary, this book provides answer to “what is water?” It is composed of three parts. The first part presents (Chapter 1) the new theory of molecular structure of water and its experimental evidences and confirmations. The second part summarizes and describes the physical properties, especially anomalous and flow features of water, which affirm that water has wide and various applications in industry, agriculture, medicine, science research and everyday life. The behaviors of nonlinear excitation as well as the peculiarities of interaction of water with an externally applied magnetic field and the theory of water magnetization,

in which all of non-linear physics phenomena occurred in modern science, were all shown in water, but cannot be matched by other substances, i.e., we have not discovered any other substances that have so many dynamic characteristics of novel properties up to now. The third part elucidates the relation of water with life and life activities, and explains that “there are no life and life activities without water. The three parts associate and link each other to build and constitute a complete book in water science.

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