BOOK REVIEWS

Drago Grdenić

Molekule i kristali
Uvod u strukturnu kemiju
[Molecules and Crystals
Introduction to Structural Chemistry]

Fifth Edition
Školska knjiga, Zagreb, 2005, pages 447
ISBN 953-0-30909-0 (hard cover)

The various properties of materials depend upon the structure of molecules from which they are built, but they are also influenced by the arrangement of molecules in their crystal structures. Recent scientific results in determining molecular and crystal structures have revolutionized our understanding of the many roles played by molecules and crystals in different fields – from physics and chemistry to material and life sciences. The extended and revised fifth edition of *Molekule i kristali. Uvod u strukturnu kemiju* [Molecules and Crystals. Introduction to Structural Chemistry] by Professor Drago Grdenić is an up-to-date survey of structural chemistry, covering traditional concepts as well as a modern approach to this exciting field of science.

The book comprises eight chapters. After the first, introductory chapter explaining the physical bases of molecular structure, such as harmonic oscillator, heat of radiation and atomic spectrum of hydrogen, the reader is introduced to the structure of atoms and to the problem of the chemical bond. The second chapter, entitled *Electronic Structure of Atoms*, deals with the unavoidable Bohr theory of the hydrogen atom and Bohr-Sommerfeld model of the atom, continuing with the magnetism of atoms, electronic orbitals and spectral terms. The third chapter on *Atomic Orbitals* provides the necessary explanation of the wave function and wave equation, while the fourth chapter under the title *Polyelectronic Atoms* discusses the electronic structure of the helium atom, the periodic table of elements as well as the electronic configuration and orbitals in polyelectronic atoms. With this chapter the reader is introduced to the problems of chemical bonding, problems covering a great deal of the rest of the book. The fifth chapter entitled *Covalent Bond* deals with different types of chemical bonding, describing the valence bond and molecular orbitals methods and discussing homonuclear and heteronuclear diatomic molecules and polyatomic molecules, localized and delocalized π-bonding, symmetry of molecules, molecular spectra and different interatomic interactions (van der Waals and covalent radii, electronegativity and molecular dipole moments) and ends with the basic stereochemical rules. Chapter Six on the *Ionic Bond* deals with the ionic molecules, ionic crystals, structure of crystals and finally with the nature of the hydrogen bond. As a crystallographer, I am particularly pleased with the newly added section dedicated to the fundamentals of crystallography, theory of diffraction and the basic knowledge of X-ray structure analysis. It stands to reason because some of the most exciting scientific developments (let me just mention the results achieved in material science and biological crystallography) in recent years have come from X-ray crystallography. Chapter Seven under the title *Complex Compounds* presents the theory of coordination, magnetic properties of complexes, ligand-field theory, and the nuclear magnetic and paramagnetic resonance methods. The subject of the last, eighth chapter is *Metallic Bond*, describing the structure of metals, alloys and intermetallic compounds as well as the electronic theory of metals. In the supplements, the author gives the basic physical constants, atomic units, Greek alphabet and the periodic table of elements. Selected bibliography is of particular help to curious and ambitious readers, saving their time in searching sources to refresh the basic facts of mathematics, physics and chemistry,

The new edition of this book will find its readers among most under- and postgraduate students and among all those interested in structural chemistry, in the same way as its previous editions have done. The book is clearly and comprehensively written. Citing the author himself: »With this book, without too much mathematics, simply but exactly, students come to know in what way modern chemistry, by applying quantum theory and mechanics, responded to the essential issues of chemical affinity and valency, chemical bonding – ionic, covalent and metallic, and to the question of molecular structure as a result of directed covalent bond.« All that reveals an experienced author, university teacher and active scientist. It is a pity that as yet we have only its Croatian edition. Its English edition would be more than welcome.

Boris Kamenar