

Preface

How would our planet Earth look like without nonmetals? No water, no air, no life! Not even rocks and sand since oxygen and silicon are responsible for 72.7% of the mass of crustal rocks on the Earth. The human body consists of 96.6% of oxygen, carbon, hydrogen and nitrogen. If all the other nonmetallic elements are added, we end up with 98.0%. Nonmetal compounds play a crucial role in our daily life and in industry as you will see in this book. It is therefore obvious that the chemistry of the nonmetals is a major part of the chemical education at all levels, from high school to university.

The book you are holding in your hands is very special to me. I wrote the first German edition at the very early stage of my academic career, shortly ahead of my one-year sabbatical leave at M.I.T., Cambridge (Massachusetts). It originated from my lectures at the Technical University Berlin, the place known as a hotspot of nonmetal chemistry research. With the years, the book became my lifetime project. I was fortunate enough to share my passion and interest in the chemistry of the nonmetals (and the yellow element in particular) with many friends and colleagues in academia and industry all over the world. Thus, the book was always nourished with the modern developments in fundamental and industrial research.

Five editions of this monograph have been published by de Gruyter, Berlin/Boston, each time completely modernized and extended. This newest international edition is an updated translation of the latest German edition of 2013. I am grateful to my two younger colleagues who share the same passion – Prof. David Scheschkewitz at Saarland University (Germany) who contributed in translating and updating half of the present edition; and Prof. Ingo Krossing at the University of Freiburg (Germany) whose know-how enriched several chapters of a previous German edition.

The book presents an infinite variety and marvelous chemical subtlety of the 22 elements occupying the upper-right section of the Periodic Table and of hydrogen, which was at the origin of the universe when it started 13.8 billion years ago and from which all other elements were formed by nuclear reactions. The work is organized in two parts: Part I explains the basic theoretical concepts needed to understand the structures and reactions of (nonmetallic) molecules and crystals. The larger Part II presents the syntheses, structures and applications of the corresponding compounds and materials. We also address their significance in daily life, chemical industry, environment, material science and farming wherever possible.

Numerous review articles and original publications are cited in footnotes and encourage the readers to study certain topics more extensively. To keep the size of the footnotes with nearly 1000 references under control, however, only one author is given if there are more than three. In addition, well-established handbooks of

inorganic chemistry (e.g., GMELIN¹) and chemical technology (e.g., ULLMANN² WINNACKER-KÜCHLER³ BÜCHEL-MORETTO-WODITSCH⁴ and KIRK-OTHMER⁵) may be consulted as a useful source of information. Literature closing date was spring 2019.

In recommending the book to its readers, I like to acknowledge the advice by Profs. Sebastian Hasenstab-Riedel and Christian Müller of the Free University Berlin and the help by Dr. Anja Wiesner who assisted with the graphics. Furthermore, I am most grateful to my wife Dr. Yana Steudel for many years of support and cooperation on the various editions of this book. De Gruyter Publisher in Berlin supported this project from day 1, so that many people who worked with me all these years should be acknowledged.

Many colleagues, coworkers and students contributed to the success of this book with their comments and suggestions and I will be happy to hear from the readers of this edition too.

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June 2019
Ralf Steudel

1 *Gmelin Handbook of Inorganic and Organometallic Chemistry* – 8th edition, Springer, book series with 185 volumes (partly in English), published in 1936–1995.

2 *Ullmann's Encyclopedia of Industrial Chemistry*, Wiley-VCH, Weinheim, **2006**; many volumes and online edition.

3 Winnacker-Küchler: *Chemische Technik*, Vol. 3: *Anorganische Grundstoffe*, 5th ed., Wiley-VCH, Weinheim, **2005**.

4 K. H. Büchel, H.-H. Moretto, D. Werner (eds.), *Industrial Inorganic Chemistry*, 2nd ed., Wiley-VCH, Weinheim, **2008**.

5 Kirk-Othmer (eds.), *Encyclopedia of Chemical Technology*, 5th ed., Wiley, New York, **2004**; book series with 27 volumes.