

## INTRODUCTION

The present review of Inorganic Chemistry course is developed in the form of reference schemes, presenting the information on one or several related elements derivatives and their mutual transformations. The compounds are placed from left to right in an order corresponding to the increase in the formal oxidation number of the element considered (the numbers being noted in the upper part of each page) so that peroxide derivatives usually finish this sequence. For each distinct oxidation state the upper position in the column is occupied by an oxide, its hydrated forms, followed then by basic (and oxo) salts, normal salts of oxoacids (such as halogenates, sulfates, nitrates, phosphates, carbonates, acetates, oxalates etc.). Below are placed binary derivatives (in an order corresponding to the decrease in the second element group number) - halides, sulfides etc. and the most prominent representatives of complex derivatives. Cationic forms are placed in the left side of this column and the anionic - in the right one. The position of each compound in this scheme is unambiguously determined in this approach by the central atom oxidation number (in the horizontal direction) and the nature of ligand (in the vertical one), which simplifies considerably the search for necessary information.

The mutual transformations are displayed by arrows in the proximity of which are noted the reagents or other factors responsible for the reaction pathway such as catalysts, solvents (their composition is given in brackets), temperature, pressure, irradiation by visual ( $h\nu$ -Vis) or ultraviolet ( $h\nu$ -UV) light. Reaction byproducts are noted in brackets and supplied with the “-” sign. The reactions proceeding without an oxidation number change are shown by solid arrows, oxidation processes by dotted arrows (---), and reduction processes by dot-and-dash arrows (-.-.).

Only the most important reactions, i.e. those of synthesis or the most characteristic of the given compound are present in the schemes.

The compounds are usually characterized by following data: chemical formula, in some cases the name, appearance, density, melting and boiling points or sublimation temperature, the temperature attributed to the beginning of thermal decomposition, the standard formation enthalpy ( $\Delta H = \Delta H_{298}^0$ , kJ/mole), air sensitivity, solubility in different solvents (the insoluble compounds are shown as sediments, for example,  $\text{AgCl}\downarrow$ ), acidity and basicity constants, instability constants for the complexes (the precision in the latter case being equal to the order of magnitude). In some special cases are described the magnetic and electric properties and are given the values of effective magnetic moment ( $\mu_{\text{eff}}$ ,  $\mu\text{B}$ ), dielectric constant ( $\epsilon$ ), dipole moment ( $\mu$ , D) and is provided a short description of crystalline and molecular structure: the lattice type (for the structural type representatives), unit cell parameters (for pure elements polymorphs only), coordination number and coordination polyhedron of the central atom, interatomic distances ( $\text{\AA}$ ) and bond angles ( $^\circ$ ) and hybridization types. The composition of the coordination polyhedron is described in the following manner: in the rectangular brackets are given the central atom, terminal and bridging ligands, the

index of the latter being given as a fraction, the numerator of which shows the number of such ligands and the denominator - the number of bonds in which they participate. For example, in the  $[\text{Cu}(\text{H}_2\text{O})_2\text{Cl}_{4/2}]$  octahedra, present in the structure of  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  the water molecules are terminal ligands, while all the four chlorine atoms there are bidentate bridging ones. For the most important groups are given the vibration frequencies in IR ( $\nu$ ,  $\text{cm}^{-1}$ ).

Some distinct schemes show also the formula of the most important ions present in water solutions and their mutual transformations. The half-life periods for isotopes are given below their symbols. The names of minerals and customary names of chemicals are given in parentheses.

In conclusion is presented the final table devoted to stereochemistry of inorganic compounds. It was composed starting from the general idea that the coordination polyhedron corresponds to the hybridization state of the central atom, given by the valence bonding approach. In spite of all the restrictions laid upon the applicability of this approach, it seems to be helpful in systematization of the experimental data in inorganic chemistry.

The present tables can be used as a comprehensive treatise, where in a single scheme are presented and demonstrated the properties characteristic of a particular element. The adopted order of presentation permits to visualize the RedOx transitions as well as the reactions proceeding without changes in the oxidation state.

In the scope of implementation of modern training programs, which require mastering of a tremendous amount of data, such a handbook as the present tables should serve as a useful addition to textbooks and lectures, helping to set in system the delivered information.

Following textbooks and monographs were used in preparation of the tables:

B.V.Nekrasov, The Principles of General Chemistry, "Khimiya", 1973.

H.Remy, Lehrbuch der anorganischen Chemie, 1971.

F.A.Cotton, G.Wilkinson, Advanced Inorganic Chemistry, Interscience Publ., 1989.

N.S.Akhmetov, Inorganic Chemistry, Vysshaya Shkola, 1988.

N.N.Greenwood, A.Earnshaw, Chemistry of Elements, Oxford, Pergamon Press, 1984.

I.Narai-Szabo, Inorganic Crystal Chemistry, Hungarian Acad. Sci., 1969.

A.F.Wells, Structural Inorganic Chemistry, Clarendon Press, Oxford, 1986.

Handbuch der Präparativen Anorganische Chemie/ Herausgegeben von G.Brauer, III Aufl., F. Enke Verlag, Stuttgart, 1981.

Preparative Inorganic Reactions, V.1-3/ Ed. W.L.Jolly, Interscience publ., 1970.

I.Kostov, Mineralogy, Oliver and Boyd, Edinburg, London, 1968.

M.Kh.Karapetyants, M.L.Karapetyants, Main Thermodynamic Constants of Inorganic and Organic Substances, "Khimiya", 1968.

R.J.Gillespie, I.Hargittai, The VSEPR Model of Molecular Geometry, Allyn and Bacon, 1991.

Yu.Yu.Lurie, Handbook of Analytical Chemistry, "Khimiya", 1979.

In some cases the data from Gmelins Handbuch der anorganischen Chemie as well as from original publications (dating approximately up to the middle of 1995) have been used. The list

of references is given at the end of the book. The constants of elements have been checked using the data from "Chemical Encyclopedic Dictionary" (Moscow, "Soviet Encyclopedia", 1983); Handbook of Chemistry and Physics, Chem. Rubber Publishing Co. 1982.

During the last years the material included in the tables has been significantly enlarged with the aid of new data from monographs, reviews and original publications. Some changes and improvements have also been made taking into consideration the experience obtained from application of this book in teaching at the universities. Schemes contain original references, which provides the reader with an opportunity to use The Tables as a reference book, permitting to make a brief acquaintance with recently published information on some distinct derivatives or classes of compounds.

Typeset by the Higher Chemical College of the Russian Academy of Sciences.

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