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## PREFACE

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In the world chemical literature, any up-to-date monograph on the thermodynamics of organometallic compounds is absent which reviews the theory, the experimental methods and all results on the thermodynamics and thermochemistry of organometallic compounds. Their thermodynamic properties and functions are significant to design the most efficient modern processes of industrial application of organometallic compounds in various fields of technics such as electronics, machine-building, chemical, gas and oil industries and others. Moreover, these fundamental data are useful for understanding the problems of stability and instability of organometallic compounds and their reactivity in various processes.

The authors of the presented monograph are the representatives of Nizhny Novgorod chemical thermodynamics school founded by Professor I. B. Rabinovich and well known in the chemistry world. Many experimental and theoretical studies in the field of chemical thermodynamics of organometallic compounds of transition and nontransition metals were carried out under the supervision of Professor I. B. Rabinovich. The data obtained as the result of those studies are extremely accurate and the most reliable. This school has many scientific contacts with the leading chemists in the world thermodynamics. The monograph presented is a useful handbook for foundations of thermodynamics and the experimental data on thermodynamics and thermochemistry of organometallic compounds.

The monograph contains three parts. Part 1 consists of description of the principles of chemical thermodynamics. It contains six chapters covering major topics of chemical thermodynamics (the fundamental laws of thermodynamics, the theory of heat capacity, definitions of enthalpy and entropy and their calculation, the fundamental equations for closed and open systems, criteria for the proceeding and the equilibrium of chemical processes). Part 1 written by Prof. I. B. Rabinovich may be used as a short but excellent complete manual on the theory of chemical thermodynamics and thermochemistry for chemists. This part precedes the following parts containing experimental data since the principles of chemical thermodynamics constitute the basis for both the experimental and calculation methods used to obtain all the original data of this monograph. This basis also serves for developing the evaluation methods of optimal conditions of various chemical processes with participation of the organometallic compounds used in catalysis, material science (MOCVD), plasma- and laser-chemistry.

Part 2 is devoted to the thermochemical properties of organometallic compounds. The enthalpies of formation of organic compounds of transition and nontransition metals as well as the average

enthalpies of breaking the metal - organic ligand chemical bonds are evaluated and discussed. This part contains the standard enthalpy values for 630 organometallic compounds. These compounds include metals of almost all groups of the Periodic Table of elements. The chapters of this part are subdivided into sections devoted to the similar types of compounds with the same ligands. The average values of breaking enthalpies of 260 metal - ligand bonds are listed and discussed. Their dependencies on the metal and ligand nature are demonstrated in tabular and graphic forms.

Part 3 deals with the thermodynamical properties of organometallic compounds. It consists of descriptions of experiment conditions on determining the thermodynamic data of substances studied. Many tables and plots of experimental data show temperature dependencies of heat capacities of substances. The values of the heat capacity, entropy, enthalpy and Gibbs functions in a wide temperature range as well as the standard enthalpies and Gibbs functions of formation for 90 organometallic compounds are tabulated. All the data presented have been verified by authors on the basis of many publications of various authors and as well as the data obtained in the authors laboratory. They are consistent with each other. This part is divided into chapters according to the types of organometallic compounds reviewed.

The monograph collects the experimental data on thermodynamics and thermochemistry of all the organometallic compounds studied by Russian and foreign authors during many years up to the present time. All the data are critically considered and the most reliable ones are chosen as a basis. These thermodynamic and thermochemical data have a fundamental character. They may be used independently of their origin time. Because of this, the monograph is of a great value for many potential users.

This monograph can serve as a handbook and simultaneously as manual to thermodynamics and thermochemistry of organometallic compounds for chemist-researchers and technologists. It may also be recommended as an educational textbook and methodic manual to chemical thermodynamics for students, post-graduate students and post-doctoral students as well as for scientific workers. It will be interesting to students and specialists in the field of organic, inorganic, organometallic and coordination chemistry, physical chemistry and chemical physics as well as scholars in the material science field.

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