

PREFACE OF THE EDITOR

As far back as in the middle of the last century titanium was related to the class of rare metals. This was due not to its amount in the Earth's crust (estimated to be equal to about 0.4%, which is an order of magnitude higher than, for example, that of copper), but to the complexity and gradation of the technological processes involved in the production of the ductile metal suitable for manufacturing various semifinished articles. The progress in the technologies of production accompanied by accumulation of information on the properties of this metal expanded the sphere of its application, and this, in turn, has stimulated the growth in the scales of production of pure titanium and structural materials based on it.

The use of a material object in practice always rests on experimentally found and verified information on its physical characteristics. This information is gradually widened and renewed. This inevitably calls for the need to comprehend the data accumulated and carry out their comparative analysis. A full description of the substance includes a wide range of evidence which characterizes its behavior in all conceivable interactions with the environment. Such a description is the subject of encyclopedias and handbooks which naturally encompass the most representative information. Based on the experience gained by the authors, the present book solves the problem of forming such a representative information in the

field of physical phenomena studied by the experimental and theoretical thermophysics. The key moment in these phenomena is the description of the changes occurring in the object which is considered as a thermodynamic system under the conditions of thermal effect. To show the way in which one or another property changes with the temperature of the metal and to characterize the response of the metal to an external effect which leads to a change in its state — these are the major points in the content of the book. Wherever possible (or advisable), the representation of particular experimental facts was supplemented with their statistical processing and construction of analytical relations that portray the most probable change in the physical characteristic with temperature. Such kind of a problem was posed in describing the properties of titanium alloys. The dependence of the properties of the latter not only on temperature but also on the technological and thermal histories of these alloys shifts the accents of their consideration into the field of depicting the role of doping and related changes in the structure and phase states.

An analysis of the data accumulated is easy of access for specialists with some experience in statement and carrying out experimental investigations. As can be seen from the bibliographical list, the authors of the book know titanium not by hearsay. Professor V. Ya. Chekhovskoi is noted for his works in the area of high-temperature calorimetry, Dr. V. A. Petukhov is an experienced researcher in the field of dilatometry of titanium materials, Dr. B. A. Shur is a specialist in the field of radiative and optical properties, and Prof. L. R. Fokin is a well-known specialist in the field of the analysis and multiproperty statistical processing of thermodynamic data. Professor V. E. Peletskii, who has undertaken scientific editorship of the present version of the book, has been active in the field of experimental investigation of the transport (kinetic) properties of titanium and its alloys.

The integrated experience of the team of authors serves as a basis for the objectivity of their analysis of the accumulated experimental information on the properties of titanium and titanium materials.

I have to express gratitude to my colleagues who participated in the preparation of the present edition: Prof. V. Ya. Chekhovskoi (Sections 1.4, 3.2, 3.3, and 4.5), Prof. L. R. Fokin (Sections 3.1, 4.1, 4.2, 4.3, 4.4, and 4.6), Dr. B. A. Shur (Chapter 2), Dr. V. A. Petukhov (Sections 1.2, 3.5, and 3.6), with the remaining sections being prepared by your obedient servant. In preparing the text, and invaluable help was rendered by the staff members of the Department of Thermophysical Properties of the Joint Institute for High Temperatures of the Russian Academy of Sciences Kurepina Svetlana and Markina Marina, and Grigorieva Natalia who helped in preparing the bibliography.

Dedicating the present book to the creators and researchers of titanium materials of the expired 20th century, we all hope that the results of their activity re-

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flected in the book will be useful for new generations of engineers and scientists, material scientists and technologists, experimenters and theoreticians who continue their creative work on revealing the essence of titanium and titanium-containing structural materials and expand the fields of their application.

Professor V. E. Peletskii