

Preface

I am a Materials Designer. During my long-term professional career, from the early 1970s till date, my particular job is to invent, explore and develop novel types and compositions of special materials for technical applications at high and ultra-high temperatures. My customers and consumers are numerous enterprises in the aerospace industry, nuclear engineering, machinery and metallurgy. With my assistance they would like to overcome the troubles, which are directly connected with the deleterious effect of high and ultra-high temperatures on various machines, mechanisms, devices and installations. In this way I have been involved in several materials design projects focused, for example, upon leading edges of anti-ballistic missiles, critical cross-sections of nozzles in rocket and torpedo motors, nuclear fuels for spacecraft power stations, thermo-electrical insulation for Hall thrusters (ion engines), refractory diaphragms for continuing casting of metals and alloys and many other apparatuses affected by the intensive thermo-mechanical and/or thermo-chemical loading, which results in fracture or severe erosion (corrosion) of the main parts. From the beginning of my career I have collected all the information about physical and chemical properties of high and ultra-high temperature substances: elements, chemical compounds, alloys and composites, which are extremely necessary for the selection of known materials as well as for the design of new ones. I believe, now it is the time to share this collection with all the specialists who are just working in the area of the ultra-high temperature applications of carbons, metals, ceramics and composites, or intend to do similar projects in the future. During the last three years I have updated considerably all my previous records on the ultra-high temperature materials and accommodated new experimental and calculated data recently obtained for these types of materials, including some last achievements of nanotechnology in this area. Thus, I would like to offer my readers and users a reference book containing the comprehensive physico-chemical description of all the substances and materials with melting (sublimation or decomposition) points around or above 2500 °C. The first volume of the book contains data on the elemental materials (carbon and refractory metals); the next volumes will include the information on chemical compounds (carbides, nitrides, oxides, borides, silicides) and complex

materials (refractory alloys, carbon and ceramics containing composites). I hope that the book will be of interest to many researchers, engineers, postgraduate and undergraduate students working or studying in the different engineering and technological areas connected with high and ultra-high temperature environments.

Also, I would like to ask everybody, who has any remarks, observations, or possibly corrections and personal opinions, concerning the book and its contents, to send them directly to my e-mail. It will be very useful for the author to take into account all these responses before publishing the next volumes.

Like any author of a scientific book, I am indebted to previous researchers and writers on ultra-high temperature materials from USA, UK, Ukraine, Russia and many other countries. However, first of all I have to acknowledge the encouragement of my colleagues and friends from Manchester and UK, who helped me to adapt to the British Academy conditions since I immigrated to the UK in 2003. I am absolutely sure that this book had no chance to appear without their kind assistance to me in continuing my career here. Since 2005 I have been supported by Prof. Keith Ross, former Director of Institute for Materials Research (University of Salford, Manchester) in all my undertaking activities in the university. Also, I would like to express my sincere gratitude to other Mancunians, my friends and colleagues: Prof. Alan Oates, Dr. Daniel Roach, Dr. Olga Umnova, Ms. Vera Barron, all from the University of Salford; Prof. Frank Sale and Prof. Kostya Novoselov from the University of Manchester; Dr. Vlad Vishnyakov and Prof. John Colligon from the Manchester Metropolitan University, as well as Oxbridge and London representatives: Prof. Richard Brook and Prof. Richard Todd from the University of Oxford; Dr. Kevin Knowles from the University of Cambridge; Prof. Xiao Guo and Prof. Mohan Edirisinghe from the University College of London; Prof. Mike Reece from Queen Mary, University of London, and finally my special thankfulness to Prof. Julie Yeomans from the University of Surrey and all our colleagues from the SCERN project.

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