
Preface

This book summarizes the results of the experimental studies of phase relations in the chemical systems relevant to Earth, carried out by the author in a time period of over 20 years between 1979 and 2001. It is based on 1,000 piston-cylinder experiments at pressures up to 4 GPa and close to 700 experiments carried out with a multi-anvil apparatus at pressures up to 24 GPa. The emphasis in these studies was on internal consistency. Large sets of data were produced using the same sample assembly, high-pressure apparatus, experimental procedures and calibrations by the same experimentalist to maximize the internal consistency. The results were published in 70 peer-reviewed articles listed at the end of the book. These are referenced only by the corresponding number, while the full reference is given for all other sources.

The need for a summary, possibly in the form of a book, had become evident early on in the course of these studies, since it was impossible to publish intermediate results of separate research projects within the framework of an internally consistent thermodynamic model, while the work was still in progress. Hence, this book was in preparation for almost 20 years. In addition to the data produced by the author, the book summarizes also the research at high pressures and temperatures carried out mostly in the second half of the last century by many other experimental petrologists. These studies would not have been possible without the generous financial support by the funding agencies for basic research, particularly the National Science Foundation of the United States government. Unfortunately, the funding for the experimental petrology, and particularly the phase equilibrium studies, has been in decline, and the window of opportunity in this field may have already closed.

Several crucial developments were essential for this work, such as the invention of the piston-cylinder and multi-anvil devices for achieving high pressures, the development of the corresponding experimental techniques, the invention of the electron microprobe for the analysis of the experimental products, the invention of the personal computer and the progress in increasing its computing speed, and finally the development of the word processing (Microsoft Word) and the graphics design (Micrografx Designer 7) software. Hence, in retrospect, it is quite fortunate that all this came together in the right sequence and at the right time to make the publication of this book in 2003 possible.

As suggested by the subtitle, phase diagrams could be viewed in some way to be similar to maps: phase boundaries or state borders represent the limits of stability or control. For those who wish to locate the stability fields of various high-pressure phases or assemblages in the Earth's interior, phase diagrams serve the same purpose as maps. These phase diagrams are, of course, valid not only for the Earth but also for any other planet with a composition similar to the Earth anywhere in the universe. Hence, these phase diagrams should appear familiar to any life-form that reached our level of intelligence and progress, has optical sensory receptors, and sufficient interest in petrology.

Preface to the 10th Anniversary Edition

Until recently, research articles have mostly been colorless. From all of my publications, only the last one [70] has color figures. The first edition of this book includes the largest collection of the calculated phase diagrams published so far. The second edition includes the largest collection of phase diagrams published so far in color. This set of color figures was mostly completed by the time the first edition was published on March 28, 2003, to be used in scientific presentations. Due to unforeseen circumstances, these phase diagrams have not been seen by anyone until now. Due to these unforeseen circumstances, I do not foresee any major scientific contribution, change or challenge to this book in any foreseeable future. I thank my son Andrew for helping me, albeit reluctantly, to print the final high-quality figures used in this edition from, by now, obsolete graphics files. I hope you will enjoy viewing phase diagrams in color as I did for the last 10 years.

Long Island

Tibor Gasparik

Phase Diagrams for Geoscientists

An Atlas of the Earth's Interior

Gasparik, T.

2014, XI, 462 p. 113 illus., 112 illus. in color., Hardcover

ISBN: 978-1-4614-5775-6