

High Temperature Experiments in Chemistry and Materials Science

Ketil Motzfeldt



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Norway*



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**High Temperature
Experiments in Chemistry
and Materials Science**

Foreword

This book sets a standard for reliable high temperature experiments. It originates from the distinguished group in high temperature research at Institute of Inorganic Chemistry, The Technical University of Norway. The group was started shortly after 1945 by Professor Håkon Flood and his students, later Professors, Tormod Førland, Kai Grjotheim and the present author, and continued with their students.

The author, Ketil Motzfeldt, has a profound understanding of experimental techniques. He gives not only the theoretical background but also practical hints to avoid pitfalls. He is responsible for only a limited number of publications (about 40) but of correspondingly high quality. The reputation of the Institute of Inorganic Chemistry as a first rate experimental laboratory is to a large extent due to Motzfeldt's assistance to colleagues and students.

High temperature systems are usually characterized by thermodynamics. Temperature and pressure are the two essential parameters. The book describes equipment and materials needed to obtain a well characterized temperature and how temperature and pressure are measured reliably.

The book is full of practical examples: How do you establish a reliable vacuum system? What are the pitfalls to avoid in order to obtain the correct temperature? What materials should be chosen, and are two chosen materials compatible in contact at temperatures above 2000°C?

Although the book mainly treats high temperature systems, many of the techniques are useful at lower temperatures as well. I have for instance used the boiling point method, described in detail in the book, at temperatures from 200 to 800°C. The advantage with this method is

that the experimental temperature range can be chosen so that the measurements are simple, and then you may extrapolate due to the fact that the logarithm of pressure is very nearly a linear function of $1/T$.

In general, the book has a solid scientific base, but it is pedagogical with an easy-to-read style which makes it a pleasure to read.

Harald A. Øye

Preface

The present text is centred around some central topics within high-temperature chemistry. It concerns the control and measurement of the basic properties: temperature, pressure and mass.

The text is primarily written for the newcomer with limited experience in the field. The emphasis is on 'how to do it'. Hence the text deals with materials and methods, including detailed drawings of various equipment. A final chapter relates some previous experimental investigations to justify the main title.

It is assumed that the reader is versed in chemical thermodynamics, since this is an essential background which is not included in the present text. There is, however, a lot more that has not been included. An investigation in the area of high-temperature chemistry will most often include detailed characterization of the resulting materials. Identification by X-ray diffraction is standard, and a range of other modern methods are available, but this is all outside the scope of the present text. Thus the book has neither a beginning nor an end, but it is hoped that it fills a gap in-between.

Acknowledgements

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