

## I. INTRODUCTION

The Selected Cryogenic Data Notebook has been designed to meet the general needs of the engineers and scientists working with cryogenic systems at Brookhaven National Laboratory. The objective in the preparation of this collection of data tables and charts, is to present in a summary manner the best information available on those properties and materials adjudged to be of continuing importance.

The needs for thermophysical property data for materials of importance in cryogenic systems are constantly expanding, and the availability of additional information makes it possible to continually increase both the depth and the breadth of a notebook of property data. The growing availability of new information also makes it possible to continually improve the accuracy of the property data. With additional study of the available information, the uncertainty of data tables may also be defined. This work is, therefore, issued in loose-leaf form to permit frequent expansion and improvement of the data tabulations.

The editors wish to give particular recognition to the Data Compilation Program of the Cryogenic Data Center of the National Bureau of Standards. The Cryogenic Data Center issued a compendium\* of the properties of materials at low temperatures in 1960 from which many of the data sheets in this notebook have been derived. This data compilation program is a continuing effort for the critical evaluation and compilation of data on the thermodynamic, transport, and other thermophysical properties for the principal fluids used at low temperatures. The work of

\*A Compendium of the Properties of Materials at Low Temperatures (Phase I). Victor J. Johnson, General Editor, Wright Air Development Division Technical Report 60-56 (July, 1960); and (Phase II), Richard B. Stewart and Victor J. Johnson, General Editors, (Dec. 1961).

the Cryogenic Data Center, in addition to providing a basic collection of cryogenic property data, has also provided the information for the subsequent expansion and improvements on many of the data tabulations included in this notebook.

This notebook is composed of a series of individual data sheets, on which information is presented for a particular property of a selected material. These data sheets are arranged using materials as the primary index for data on fluids, and using properties as the primary index for data on solids. The format of the individual data sheets is as follows:

Source of Data: Literature references to the selected data are listed chronologically.

Other References: Other references to the subject are given.

Comments: Explanatory notes are included which may summarize the contents of each reference, relate information on purity of the sample for which data are given, provide estimates of the uncertainty of the data, etc.

Data Tables: Tabulations of the data are given. For subjects where only limited information is available, all of the measured values may be given. More extensive tabulations, and in particular data tables which are adopted from other data compilations, are summarized by skeleton tables.

Graphs: The data are illustrated graphically wherever the properties are available as functions of a dependent property.

Footnotes:

Footnotes are used to reference other data compilations which have been adopted as the data source.

In this issue of this notebook, it has been necessary to include some material which may not represent the best information available. In some instances new data may already be available which has not been incorporated into the present data sheets. In other cases, additional study and correlation of available data would greatly improve the utility of the data tables. However, in order to include some information on most of the subjects indexed, it has been necessary to incorporate available data sheets. It was also found difficult in this issue to present many of the data sheets in the format outlined above. The editors acknowledge the necessity to revise many of those data sheets, and it is intended that this collection of data sheets will be improved in accordance with our objectives of presenting a summary of the best data for all of the properties and materials indexed, in a consistent format.

In this introduction it has been noted that the data sheets are only summaries of the available information. It is emphasized that the user requiring additional information should consult the data sources listed on the data sheets. Reference is also made to the availability of bibliographic information on the properties of materials from the Cryogenic Data Center of the National Bureau of Standards, Boulder, Colorado. In particular this Data Center is equipped to prepare custom bibliographies for specific topics or for broad subject areas from an automated bibliography storage and retrieval system.

In conclusion, the editors wish to acknowledge the assistance received from the Cryogenic Data Center of the National Bureau of Standards. The many publications issued by this Data Center have been particularly useful in assembling this collection of data sheets. Several individuals at Brookhaven National Laboratory have also contributed significantly to this work. In particular, the editors wish to acknowledge the continuous encouragement and advice given by Dr. R.P. Shutt. The editors also wish to thank Anne M. Flood for coordinating the clerical and administrative efforts, and the Bubble Chamber Group, Electrical Drafting Section under the direction of Louis F. Both and the ISABELLE Drafting Section under the direction of Donald Gilzinger for the drafting, checking and proofreading required for the preparation of the graphs.

The Editors