REPORT ON
PHYSICAL PROPERTIES
OF
METALS AND ALLOYS
FROM
CRYOGENIC TO ELEVATED TEMPERATURES

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REPORT ON

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CRYOGENIC TO ELEVATED TEMPERATURES

Data Compiled by and Issued Under the Auspices of

THE DATA AND PUBLICATIONS PANEL

of

THE ASTM—ASME JOINT COMMITTEE ON

EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS

Prepared for the Panel by

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FOREWORD

This compilation contains about 650 sheets and 80 curves of physical property data on six metals and their alloys. The metals covered are aluminum, cobalt, iron, magnesium, molybdenum, and nickel and their alloys. The temperature range included is from cryogenic (−457 F) to elevated (4500 F) temperatures. Data sheets follow their respective curves in each section except for Cast Iron. Insufficient data were gathered to justify making curves for the section on Cast Iron.

Since the closing date of this compilation, the authors have learned of the following publications containing data on physical properties:

(1) C. R. Tipton, Jr., ed., *Reactor Handbook, Vol. 1, Materials;* Interscience Publications, Inc., New York, 1207 pp. (1960).

(2) V. J. Johnson, ed., *A Compendium of the Properties of Materials at Low Temperatures, Phase II;* General Editor: National Bureau of Standards, Cryogenic Engineering Laboratory, Boulder, Colorado (1961).

(3) *Metals Handbook,* Seventh Edition, American Society for Metals, (1961).

(4) G. Sachs, R. F. Pray, *Air Weapons Materials Application Handbook,* Syracuse University Research Institute, ARDC TR59-66, AF 18(600)-1794 (December 1959).

(5) A. Goldsmith, T. E. Waterman, H. J. Hirschhorn, *Thermophysical Properties of Solid Materials,* WADC Technical Report 58-476, (August 1960). Vol. 1, *Elements;* Vol. 2, *Alloys;* Vol. 3, *Ceramics;* Vol. 4, *Cermets, Intermetalics, Polymerics, and Composites;* Vol. 5, *Index.*

(6) W. D. Wood, H. W. Deem, C. F. Lucks, *The Emittance of Titanium and Titanium Alloys,* Defense Metals Information Center, Battelle Memorial Institute, Columbus, Ohio, DMIC Memorandum No. 91, (March 17, 1961).

(7) W. D. Wood, H. W. Deem, C. F. Lucks, *The Emittance of Coated Materials Suitable for Elevated Temperature Use,* Defense Metals Information Center, Battelle Memorial Institute, Columbus, Ohio, DMIC Memorandum (1961).

(8) W. D. Wood, H. W. Deem, C. F. Lucks, *The Emittance of Iron, Nickel, and Cobalt and Their Alloys,* Defense Metals Information Center, Battelle Memorial Institute, Columbus, Ohio, DMIC Memorandum (1961).

(9) W. D. Wood, H. W. Deem, C. F. Lucks, *The Emittance of Stainless Steels,* Defense Metals Information Center, Battelle Memorial Institute, Columbus, Ohio, DMIC Memorandum (1961).

(10) W. D. Wood, H. W. Deem, C. F. Lucks. Other emittance sections covering graphite, ceramics, niobium, tantalum, molybdenum, beryllium, and chromium will be published in 1961 by the Defense Metals Information Center, Battelle Memorial Institute, Columbus, Ohio.

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This publication, sponsored by the Data and Publication Panel of the ASTM-ASME, Joint Committee on Effect of Temperature on the Properties of Metals, is one of a series designed to make high temperature data from as many sources as possible available under one cover for each family of metals.

The following reports are available from either ASTM or ASME Headquarters.

"Report on the Elevated-Temperature Properties of Selected Super-Strength Alloys"—*ASTM STP No. 160*

"Report on the Elevated-Temperature Properties of Carbon Steels"—*ASTM STP No. 180*

"Report on the Elevated-Temperature Properties of Coppers and Copper-Base Alloys"—*ASTM STP No. 181*

"Report on Relaxation Properties of Steels and Super-Strength Alloys at Elevated Temperatures"—*ASTM STP No. 187*

"Report on the Elevated-Temperature Properties of Wrought Medium-Carbon Alloy Steels"—*ASTM STP No. 199*

"Report on the Elevated-Temperature Properties of Weld-Deposited Metal and Weldments"—*ASTM STP No. 226*

"Report on the Elevated-Temperature Properties of Chromium Steels (12-27 per cent)"—*ASTM STP No. 228*

"Report on Properties of Cast Iron at Elevated Temperatures"—*ASTM STP No. 248*

"Literature Surveys on Influence of Stress Concenetrations at Elevated Temperatures and The Effects of Nonsteady Load and Temperature Conditions on the Creep of Metals"—*ASTM STP No. 260*

"Report on the Elevated-Temperature Properties of Aluminum and Magnesium Alloys"—*ASTM STP No. 291*