HANDBOOK OF

Vapor PRESSURE

VOLUME 4

INORGANIC COMPOUNDS AND ELEMENTS

Carl L. Yaws

HANDBOOK OF Vapor PRESSURE

VOLUME 4
INORGANIC COMPOUNDS AND ELEMENTS

Carl L. Yaws

Gulf Publishing Company
Houston, London, Paris, Zurich, Tokyo

Handbook of Vapor Pressure, Volume 4

ISBN 0-88415-394-0

Gulf Publishing Company
Book Division
P.O. Box 2608, Houston, Texas 77252-2608

10 9 8 7 6 5 4 3 2 1

Printed on Acid-Free Paper (∞)

Library of Congress Cataloging-in-Publication Data

Yaws, Carl L.
Handbook of vapor pressure / Carl L. Yaws.
p. cm.
Includes bibliographical references and index.
Contents: v. 1. C_1 to C_4 compounds, — v. 2. C_5 to C_7 compounds, — v. 3. C_8 to C_{28} compounds — v. 4. Inorganic Compounds and Elements.
ISBN 0-88415-189-1 (v. 1: acid-free). — ISBN 0-88415-190-5 (v. 2: acid-free). — ISBN 0-88415-191-3 (v. 3: acid-free) — ISBN 0-88415-394-0 (v. 4: acid-free)
1. Organic compounds—Tables. 2. Vapor pressure—Tables. I. Title.
QD257.7.Y39 1994
661′.8—dc20 93-34106
CIP

British Library Cataloguing in Publication Data. A catalogue record for this book is available from the British Library.

CONTRIBUTORS

Li Bu	Graduate student, Chemical Engineering Department, Lamar University, Beaumont, Texas 77710, USA
Sachin Nijhawan	Graduate student, Chemical Engineering Department, Lamar University, Beaumont, Texas 77710, USA
Carl L. Yaws	Professor, Chemical Engineering Department, Lamar University, Beaumont, Texas 77710, USA

ACKNOWLEDGMENTS

Many colleagues and students have made contributions and helpful comments over the years. The author is grateful to each: Jack R. Hopper, Joe W. Miller, Jr., C.S. Fang, K.Y. Li, Keith C. Hansen, Daniel H. Chen, P.Y. Chiang, H.C. Yang, Xiang Pan, Xiaoyan Lin, Li Bu, and Sachin Nijhawan.

The author wishes to extend special appreciation to his wife (Annette) and family (Kent, Michele, Chelsea, and Brandon; Lindsay and Rebecca; and Matthew and Sarah).

The author wishes to acknowledge that the Gulf Coast Hazardous Substance Research Center provided partial support to this work.

DISCLAIMER

PREFACE

Vapor Pressure data are important in many engineering applications in the chemical processing and petroleum refining industries. The objective of this book is to provide the engineer with such vapor pressure data. The data are presented in graphs covering a wide temperature range to enable the engineer to quickly determine values at the temperatures of interest.

The contents of the book are arranged in the following order:

- Graphs
- References
- List of compounds
- Coefficients for vapor pressure equation
- Critical properties and acentric factor

The graphs for vapor pressure as a function of temperature are arranged by chemical formula to provide ease of use. Many of the graphs cover the full liquid range from melting point to boiling point to critical point. English units are used, but for those involved in metric and SI usage, each graph displays a conversion factor to provide SI units.

The coverage of inorganics is comprehensive and encompasses 343 compounds, including carbon oxides such as carbon monoxide and carbon dioxide; nitrogen oxides such as nitric oxide and nitrous oxide; sulfur oxides such as sulfur dioxide and sulfur trioxide; hydrogen oxides such as water and hydrogen peroxide; ammonias such as ammonia and ammonium hydroxide; hydrogen halides such as hydrogen chloride and hydrogen fluoride; sulfur acids such as sulfuric acid and hydrogen sulfide; hydroxides such as sodium hydroxide and potassium hydroxide; silicon halides such as trichlorosilane and silicon tetrachloride; ureas such as urea and thiourea; cyanides such as hydrogen cyanide and cyanogen chloride; hydrides such as silane and diborane; sodium derivatives such as sodium chloride and sodium fluoride; aluminum derivatives such as aluminum borohydride and aluminum fluoride; and many other compound types. A total of 82 elements are covered, including hydrogen, nitrogen, oxygen, helium, argon, neon, chlorine, bromine, iodine, fluorine, sulfur, phosphorous, aluminum, lead, tin, mercury, sodium, magnesium, silicon, antimony, boron, iron, chromium, cobalt, titanium, tantalum, silver, gold, platinum, radon, uranium, and many others.

The literature has been carefully searched. The following primary references were used extensively in construction of the graphs:

- Daubert, T. E. and R. P. Danner, *Data Compilation of Properties of Pure Compounds,* Parts 1, 2, 3, and 4, Supplements 1 and 2, DIPPR Project, AIChE, New York, NY (1985–1992).
- Nesmeyanov, A. N., *Vapor Pressure of the Chemical Elements,* Elsevier, New York, NY (1963).
- Yaws, C. L., *Physical Properties,* McGraw-Hill, New York, NY (1977).
- Yaws, C. L., *Thermodynamic and Physical Property Data,* Gulf Publishing Co., Houston, TX (1992).
- Yaws, C. L. and R. W. Gallant, *Physical Properties of Hydrocarbons,* Vols. 1 (2nd ed.), 2 (3rd ed.), and 3 (1st ed.), Gulf Publishing Co., Houston, TX (1992, 1993, 1993).

Additional references are given in the section near the end of this book. These primary and additional references provide full documentation for the original sources used in regression of the data.

A list of compounds is given near the end of the book to aid the user in quickly locating the compound of interest from the chemical formula or name.

Coefficients for the vapor pressure equation are provided near the end of the book. Critical properties and acentric factor are given in the last section of the book. The tabulated values are especially arranged for quick usage with hand calculator or computer. Computer programs, containing data for all compounds, are available for a nominal fee. The programs are in ASCII which can be accessed by other software. Contact Carl L. Yaws, P.O. Box 10053, Lamar University, Beaumont, TX 77710, phone/FAX 409-880-8787.

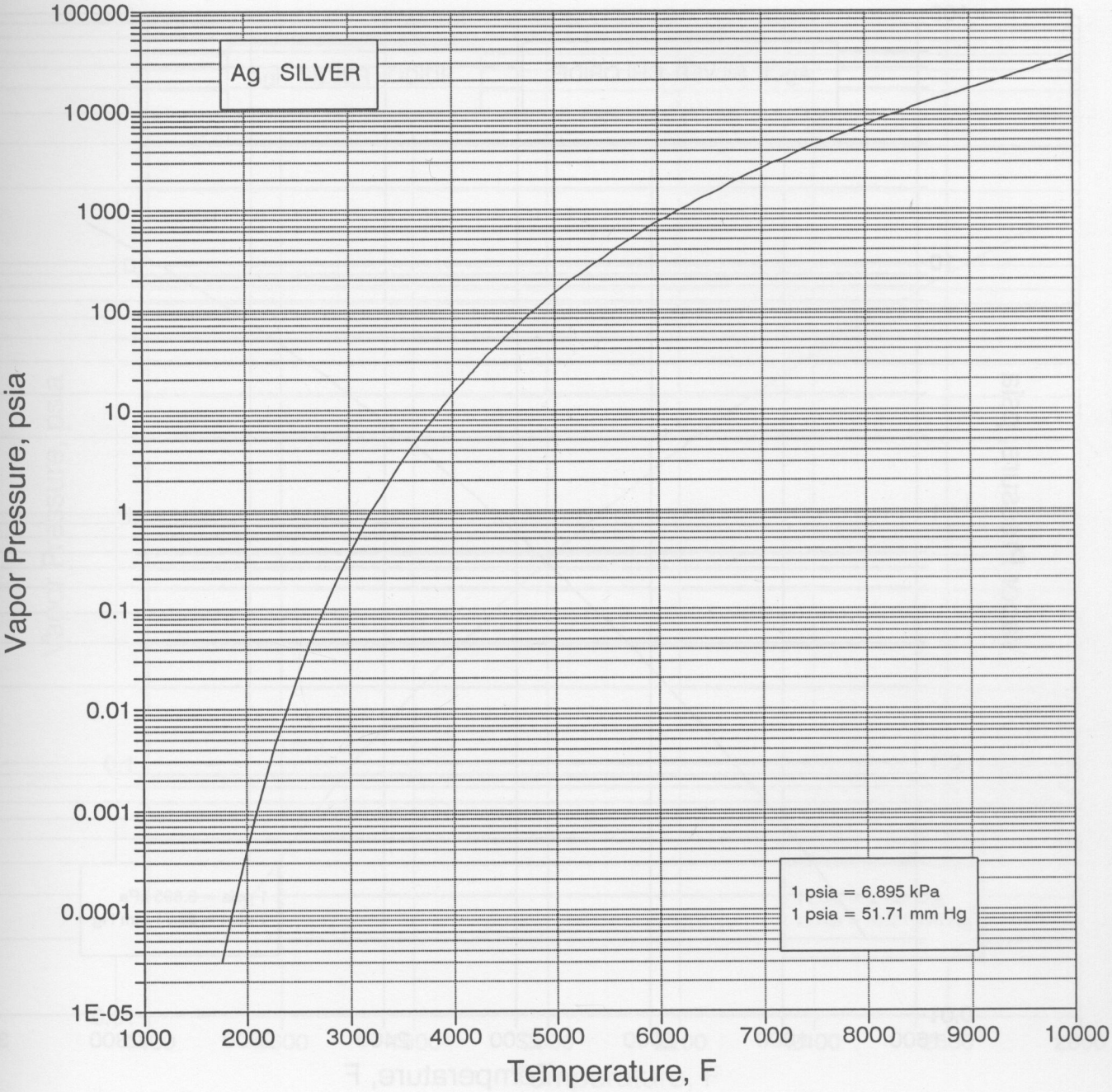
HANDBOOK OF

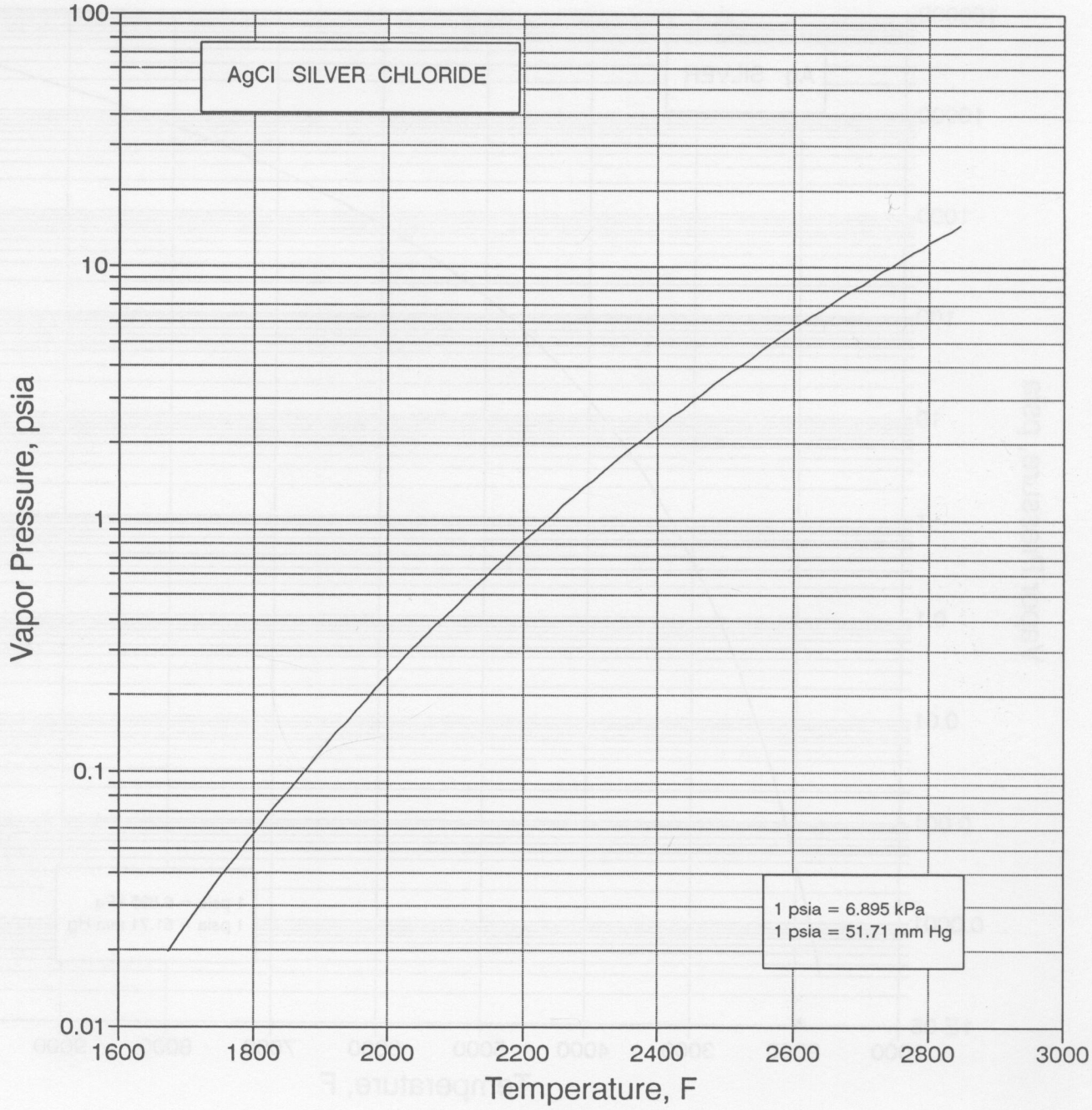
Vapor PRESSURE

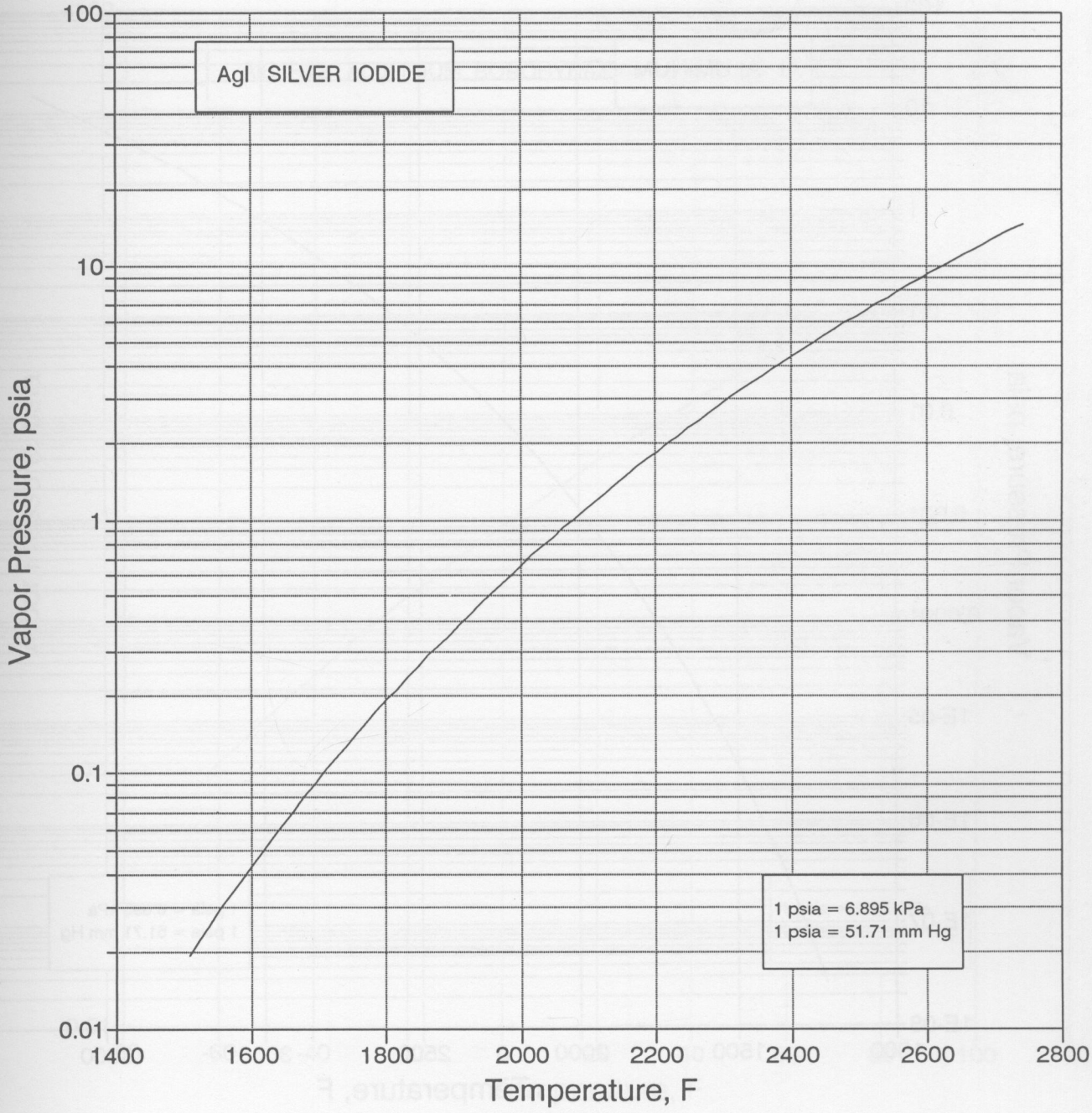
VOLUME 4

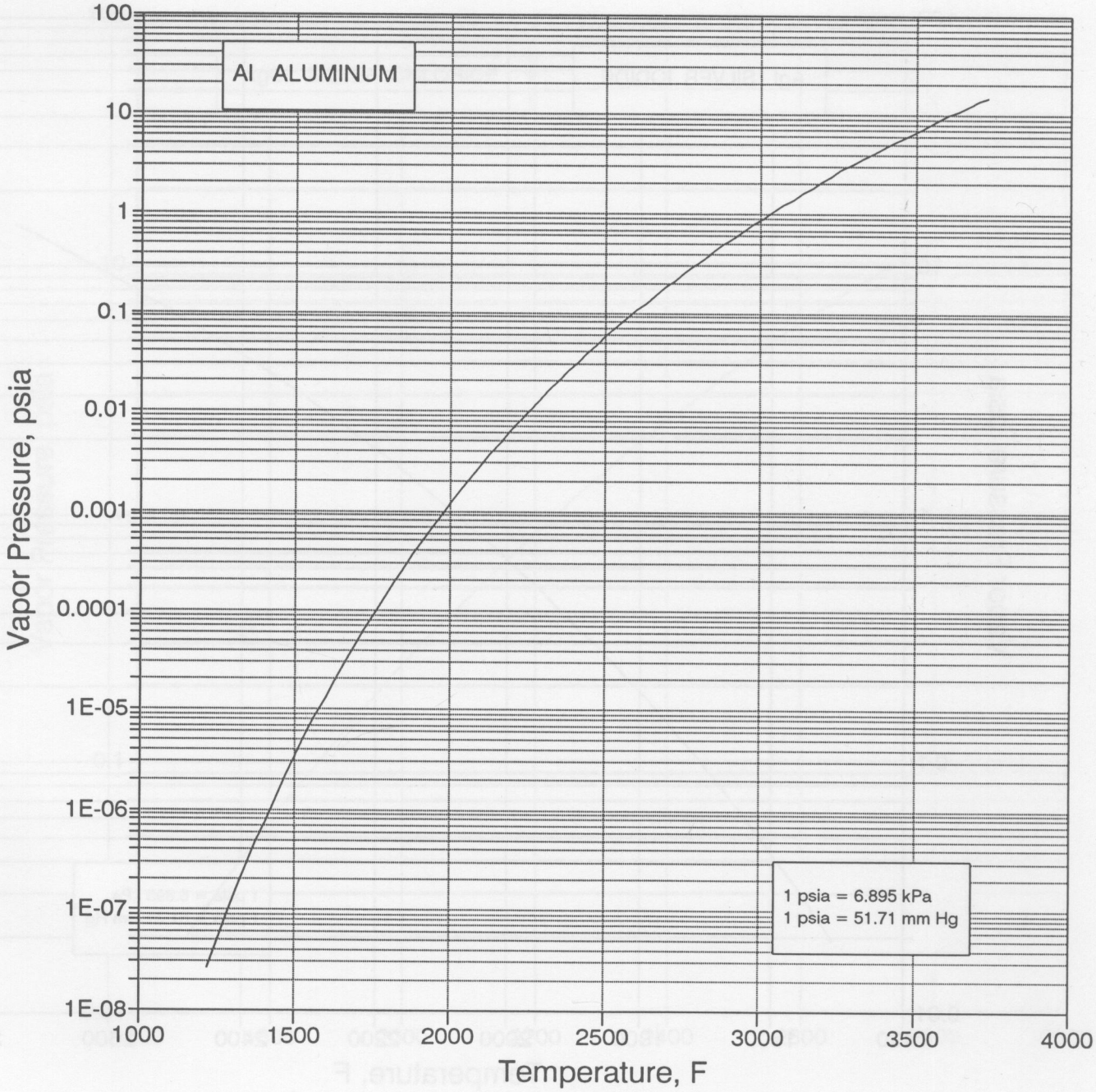
INORGANIC COMPOUNDS AND ELEMENTS

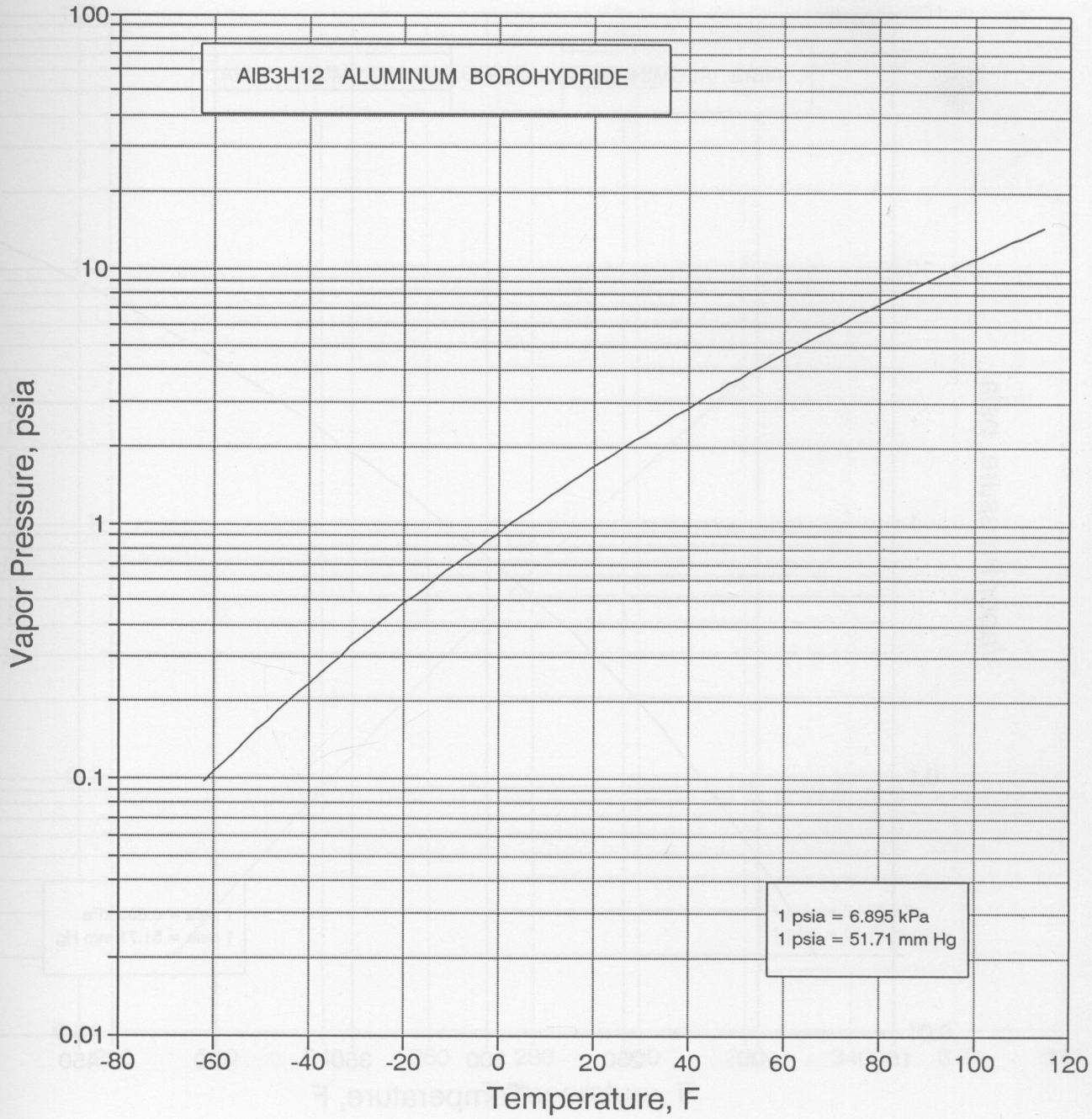
CONTENTS

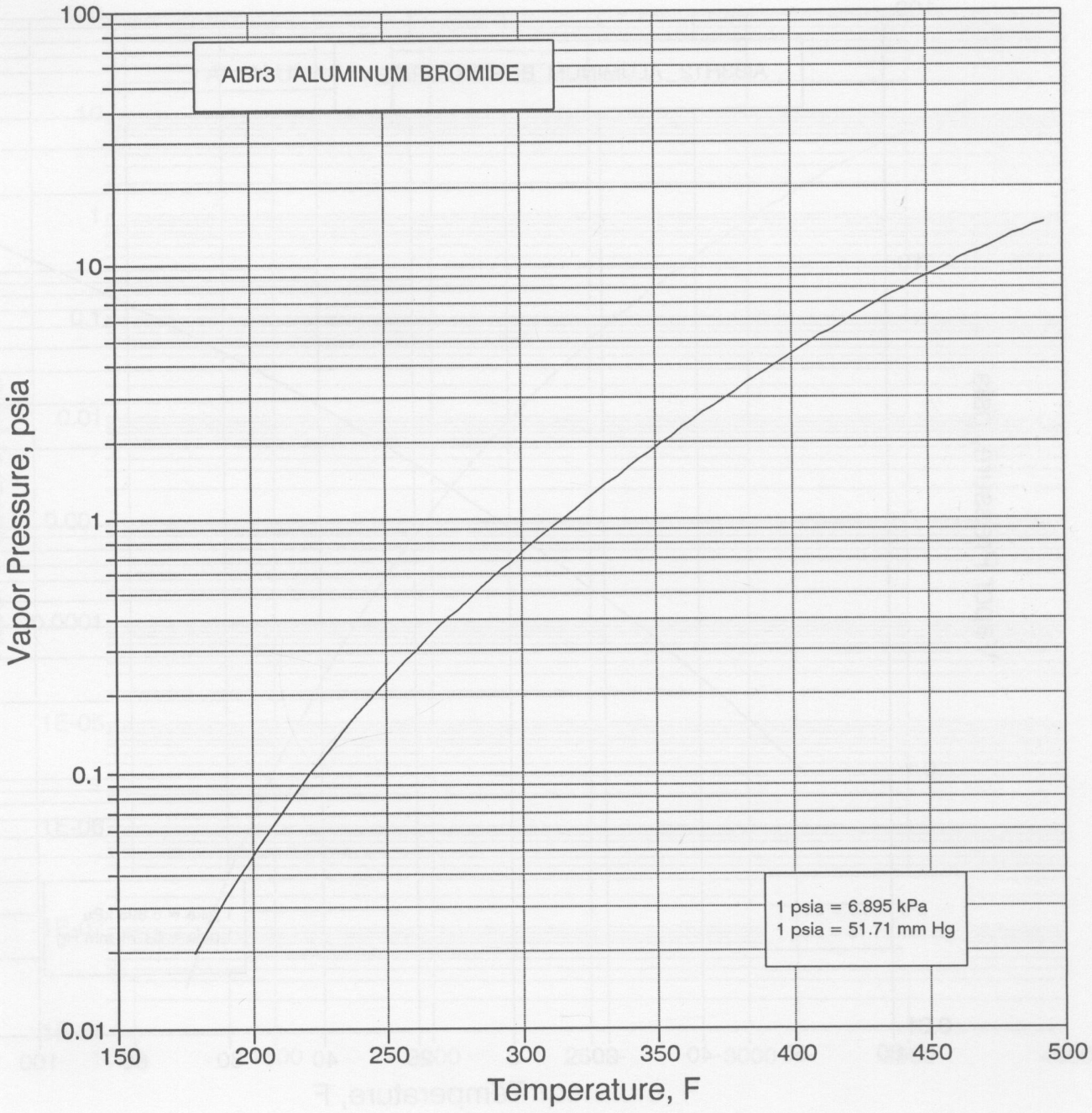

Ag SILVER
Vapor Pressure, psia
100000
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
1E-05
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg

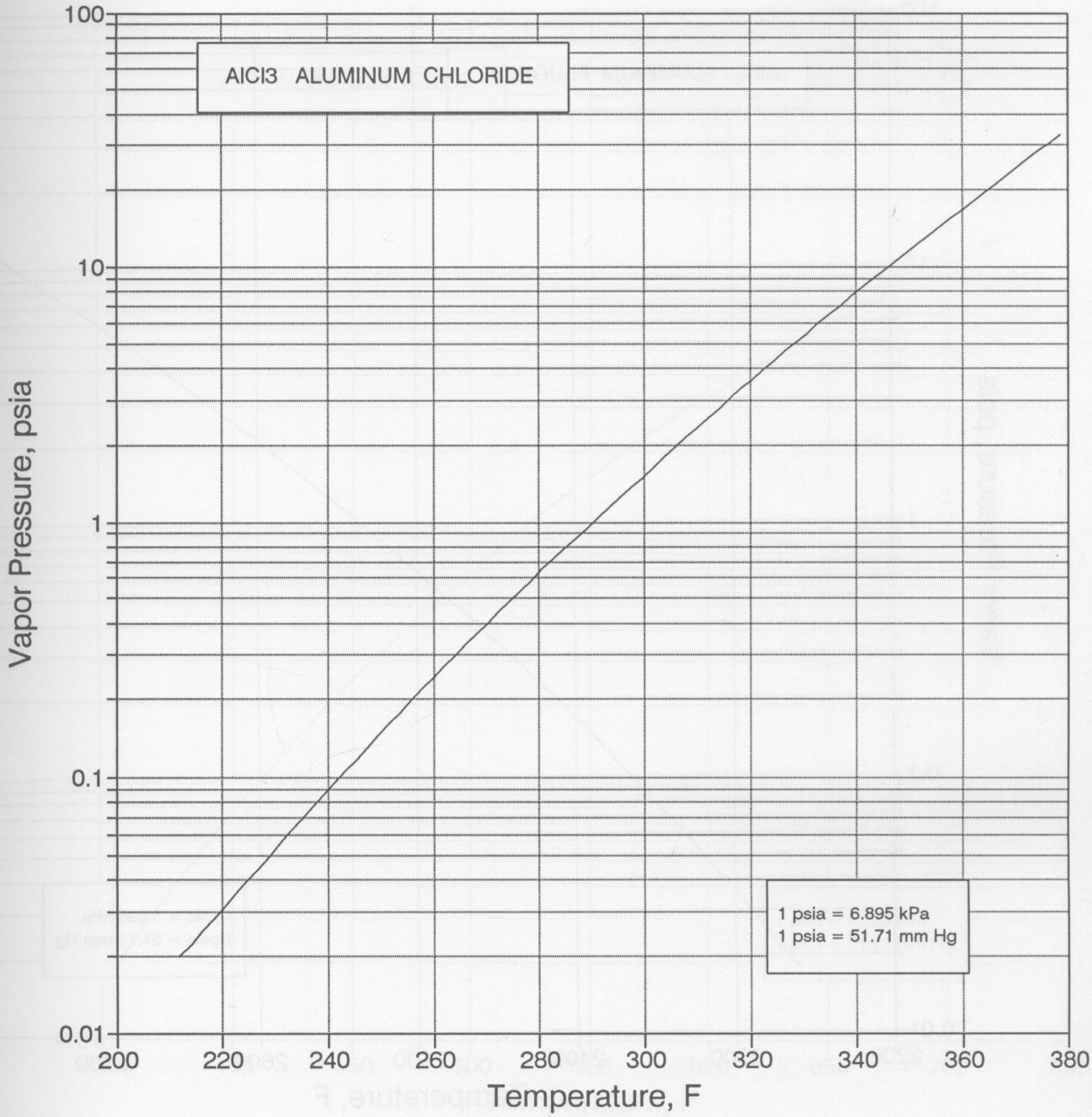

AgCl SILVER CHLORIDE
Vapor Pressure, psia
100
10
1
0.1
0.01
1600
1800
2000
2200
2400
2600
2800
3000
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg

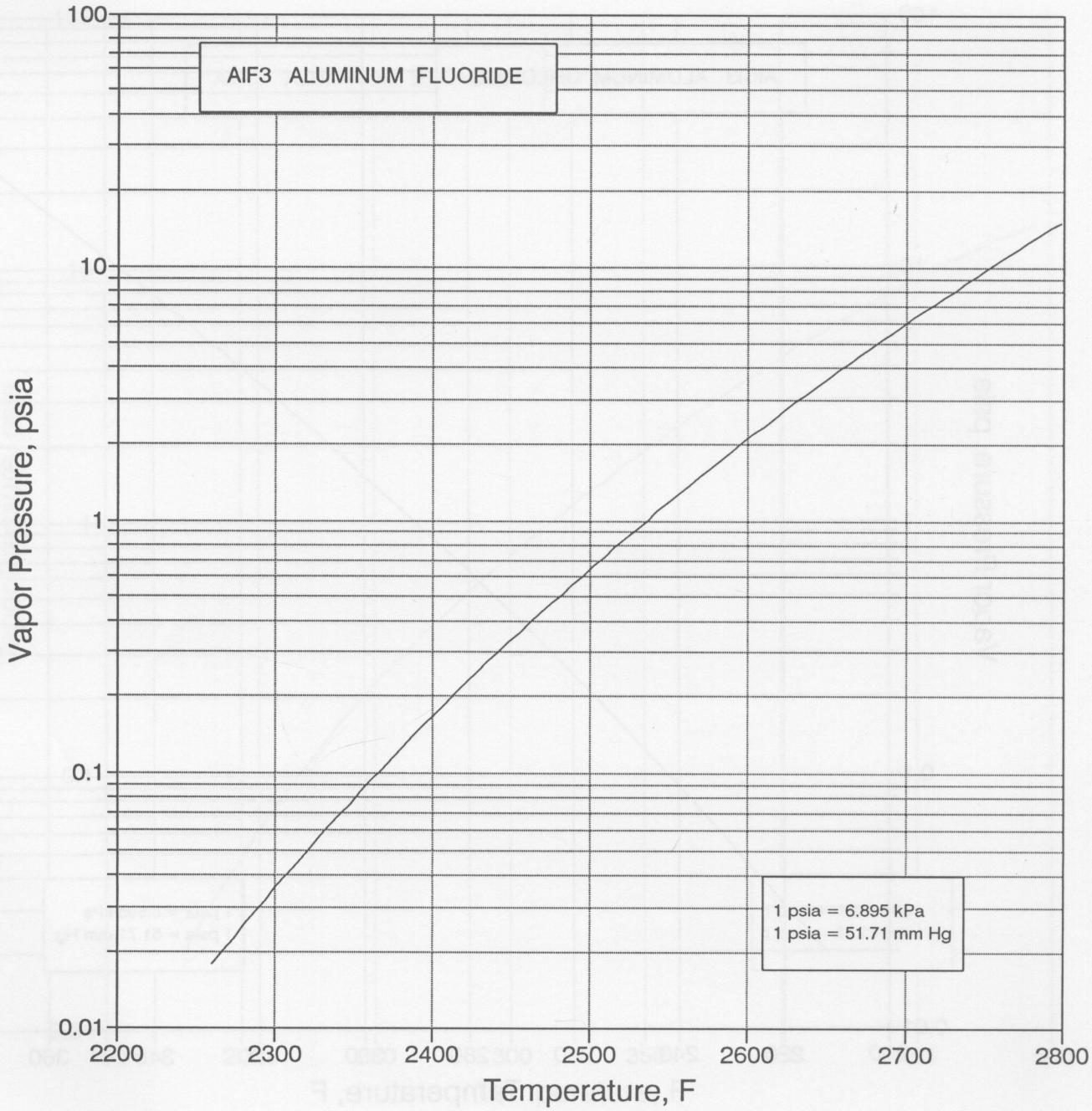



Al ALUMINUM
Vapor Pressure, psia
100
10
1
0.1
0.01
0.001
0.0001
1E-05
1E-06
1E-07
1E-08
1000
1500
2000
2500
3000
3500
4000
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg


AlB3H12 ALUMINUM BOROHYDRIDE
Vapor Pressure, psia
100
10
1
0.1
0.01
-80
-60
-40
-20
0
20
40
60
80
100
120
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg


AlBr3 ALUMINUM BROMIDE
Vapor Pressure, psia
100
10
1
0.1
0.01
150
200
250
300
350
400
450
500
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg


AICl3 ALUMINUM CHLORIDE
100
10
1
0.1
0.01
Vapor Pressure, psia
200
220
240
260
280
300
320
340
360
380
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg


AlF3 ALUMINUM FLUORIDE
100
10
1
0.1
0.01
Vapor Pressure, psia
2200
2300
2400
2500
2600
2700
2800
Temperature, F
1 psia = 6.895 kPa
1 psia = 51.71 mm Hg