M. Kurtz for carrying out the metallographic phases of this work. This work was sponsored by the AEC and performed under Contract AT-30-1 GEN-367.

Discussion of this paper, if any, will appear in JOURNAL OF METALS, May 1956, and in AIME Metals Branch Transactions, Vol. 206, 1956.

References

- ¹ L. C. C. da Silva and R. F. Mehl: *Trans. AIME* (1951) **191**, p. 155; *JOURNAL OF METALS* (February 1951).
- ² C. Wells: *Atom Movements*. (1951) p. 26. Cleveland. ASM.
- ³ O. Kubaschewski: *Trans. Faraday Soc.* (1950) **46**, p. 713.
- ⁴ A. D. Smigelskas and E. O. Kirkendall: *Trans. AIME* (1947) **171**, p. 130; *METALS TECHNOLOGY* (October 1946).
- ⁵ L. S. Darken: *Trans. AIME* (1948) **175**, p. 184; *METALS TECHNOLOGY* (February 1948).
- ⁶ R. W. Balluffi and B. H. Alexander: *Trans. AIME* (1952) **194**, p. 1315; *JOURNAL OF METALS* (December 1952).
- ⁷ R. W. Balluffi and L. L. Seigle: *Journal of Applied Physics* (1954) **25**, p. 607.
- ⁸ G. T. Horne and R. F. Mehl: *Trans. AIME* (1955) **203**, p. 88; *JOURNAL OF METALS* (January 1955).

- ⁹ M. C. Inman, D. Johnston, W. L. Mercer, and R. Shuttleworth: *Proceedings Second Radioisotope Conference*, Oxford (July 19-23, 1954); *Butterworths Scientific Publications* (1954) p. 85.
- ¹⁰ This point has been discussed by A. D. LeClaire: *Progress in Metal Physics*. (1949) **I**, p. 354. New York. Interscience Publishers Inc.
- ¹¹ U. S. Landergren and R. F. Mehl: *JOURNAL OF METALS* (1953) **5**, No. 2, p. 153.
- ¹² J. C. Fisher, J. H. Hollomon, and D. Turnbull: *Trans. AIME* (1948) **175**, p. 202; *METALS TECHNOLOGY* (February 1948).
- ¹³ A. S. Nowick: *Journal of Applied Physics* (1951) **22**, p. 1182.
- ¹⁴ A. Kuper, H. Letaw, Jr., I. Slifkin, E. Sonder, and C. T. Tomizuka: *Physical Review* (1954) **96**, p. 1224.
- ¹⁵ J. Hino: Private communication, University of Illinois.
- ¹⁶ R. W. Balluffi and B. H. Alexander: *Journal of Applied Physics* (1952) **23**, p. 953.
- ¹⁷ R. J. Barnes: *Proceedings Physical Soc., London* (1952) **65B**, p. 512.
- ¹⁸ R. W. Balluffi: *Journal of Applied Physics* (1952) **23**, p. 1407.
- ¹⁹ R. W. Balluffi: *Journal of Applied Physics* (1952) **23**, p. 1237.
- ²⁰ T. Heumann: *Naturwissenschaften* (1953) **40**, p. 164.
- ²¹ C. Zener: *Acta Crystallographica* (1950) **3**, p. 346.
- ²² A. D. LeClaire: *Acta Metallurgica* (1953) **1**, p. 438.

Technical Note

Thermal Conductivity of Vanadium and Certain Vanadium Alloys

by James L. Weeks and Karl F. Smith

IN order to determine the magnitude of thermal conductivity changes resulting from alloying vanadium with titanium and a few other elements, several samples were prepared and measured. The thermal conductivity values reported herein in Table I were determined with an apparatus previously described.¹

As in recently reported² determinations on uranium and uranium alloys, whose thermal conductivities are in the same range as vanadium,³ the accuracy of the values was checked by using synthetic sapphire.⁴ The error in the measurement is estimated to be ± 3 pct or $0.003 \text{ cal sec}^{-1} \text{ cm}^{-1} \text{ }^{\circ}\text{C}^{-1}$, whichever is larger.

The vanadium used in preparing the samples was the calcium-reduced type and was supplied by the Electro Metallurgical Co. as 99.6+ pct pure. All alloying elements used in the preparations were 99+ pct pure. A nonconsumable tungsten electrode arc furnace was used for melting the alloys and, without opening the furnace, each ingot was remelted a number of times to insure homogeneity. The samples as prepared by the Armour Research Foundation were machined from *as forged* material without annealing.

Acknowledgment

The note is based on work performed under the auspices of the AEC.

References

- ¹ J. L. Weeks and R. L. Seifert: Apparatus for the J. L. WEEKS and K. F. SMITH are associated with Chemistry and Metallurgy Divs., respectively, Argonne National Laboratory, Lemont, Ill.
- TN 282E. Manuscript, Mar. 24, 1955.

Table I. Thermal Conductivity of Vanadium and Certain Vanadium Alloys

Alloying Element, Wt Pct*	Thermal Conductivity at 70°C, Cal Sec ⁻¹ Cm ⁻¹ °C ⁻¹
None	0.084 ₄
5 Ti	0.069 ₉
10 Ti	0.058 ₂
20 Ti	0.047 ₁
10 Ti } 5 Al }	0.031 ₂
40 Ti } 5 Al }	0.024 ₀
1 Si	0.063 ₈
3 Si } 2.5 Zr }	0.050 ₀

* Balance vanadium.

Measurement of the Thermal Conductivity of Solids. *Review of Scientific Instruments* (1953) **24**, pp. 1054-1057.

² J. L. Weeks: Thermal Conductivity of Uranium and Several Uranium Alloys. *Trans. AIME* (1955) **203**, p. 192; *JOURNAL OF METALS* (January 1955).

³ C. A. Hampel: *Rare Metals Handbook*. (1954) p. 593. New York. Reinhold Publishing Corp. Thermal conductivity of vanadium is given as $0.074 \text{ cal sec}^{-1} \text{ cm}^{-1} \text{ }^{\circ}\text{C}^{-1}$ at 100°C .

⁴ J. L. Weeks and R. L. Seifert: Note Regarding the Thermal Conductivity of Synthetic Sapphire. *Journal Amer. Ceramic Soc.* (1952) **35**, p. 15. At 70°C , $K = 0.071 \text{ cal sec}^{-1} \text{ cm}^{-1} \text{ }^{\circ}\text{C}^{-1}$.