XV. THERMAL DIFFUSIVITY

contents

THERMAL DIFFUSIVITY OF ALUMINUM

Selected Values for Annealed 99.996+ % Pure Aluminum with $\rho_o \approx 3.1 \times 10^{-9}$ ohm cm

T,K	α, $cm^2\ sec^{-1}$			T,K	α, $cm^2\ sec^{-1}$
	Normal	Superconducting			
0.1	52000*	550*		70	6.3*
0.2		4400		80	4.0*
0.3		15100		90	2.9*
0.4		22400		100	2.27*
0.5	56000	26200		150	1.32*
0.6		27800		200	1.09*
0.7		28000		300	0.97
0.8		27400		400	0.94
0.9		26400		500	0.90
1.0	55000	25300		600	0.84
1.1		23600		700	0.80
1.14		23000		800	0.75
5	36000*		(fcc)	930	0.69*
10	16000*		(l)	940	0.35*
20	2500*			1000	0.36*
30	330*			1100	0.37*
40	76*			1200	0.39*
50	26*			1300	0.40*
60	11.4*			1400	0.42*

Data Source and Remarks

Eight sets of experimental data are available over the temperature ranges 0.2 to 4.1 K and 295 to 830 K. Selected values at the lowest temperatures lie between the data of Zavaritskii (1958) [1]‡ and Howling, Mendoza, and Zimmerman (1955) [2]. From 295 to 830 K selected values lie close to the data of Sonnenschein and Winn (1960) [3], Jenkins and Parker (1961) [4], and Schmidt (1961) [5], noting that the selected values are for purer aluminum than those measured by these authors.

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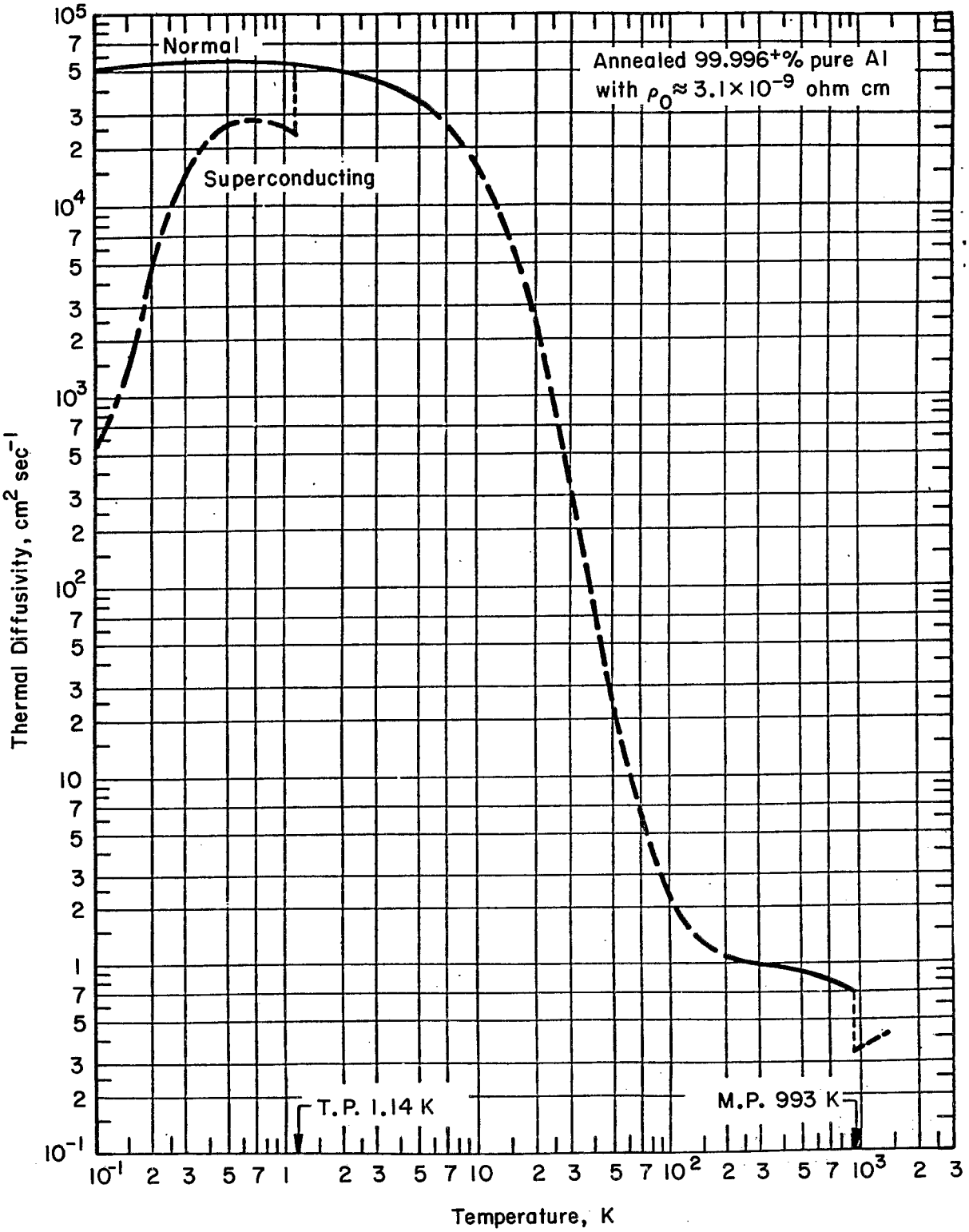
* Calculated or estimated.

‡ Numbers in square brackets designate references appearing under the heading BIBLIOGRAPHY.



Thermal Diffusivity of Aluminum

THERMAL DIFFUSIVITY OF COPPER

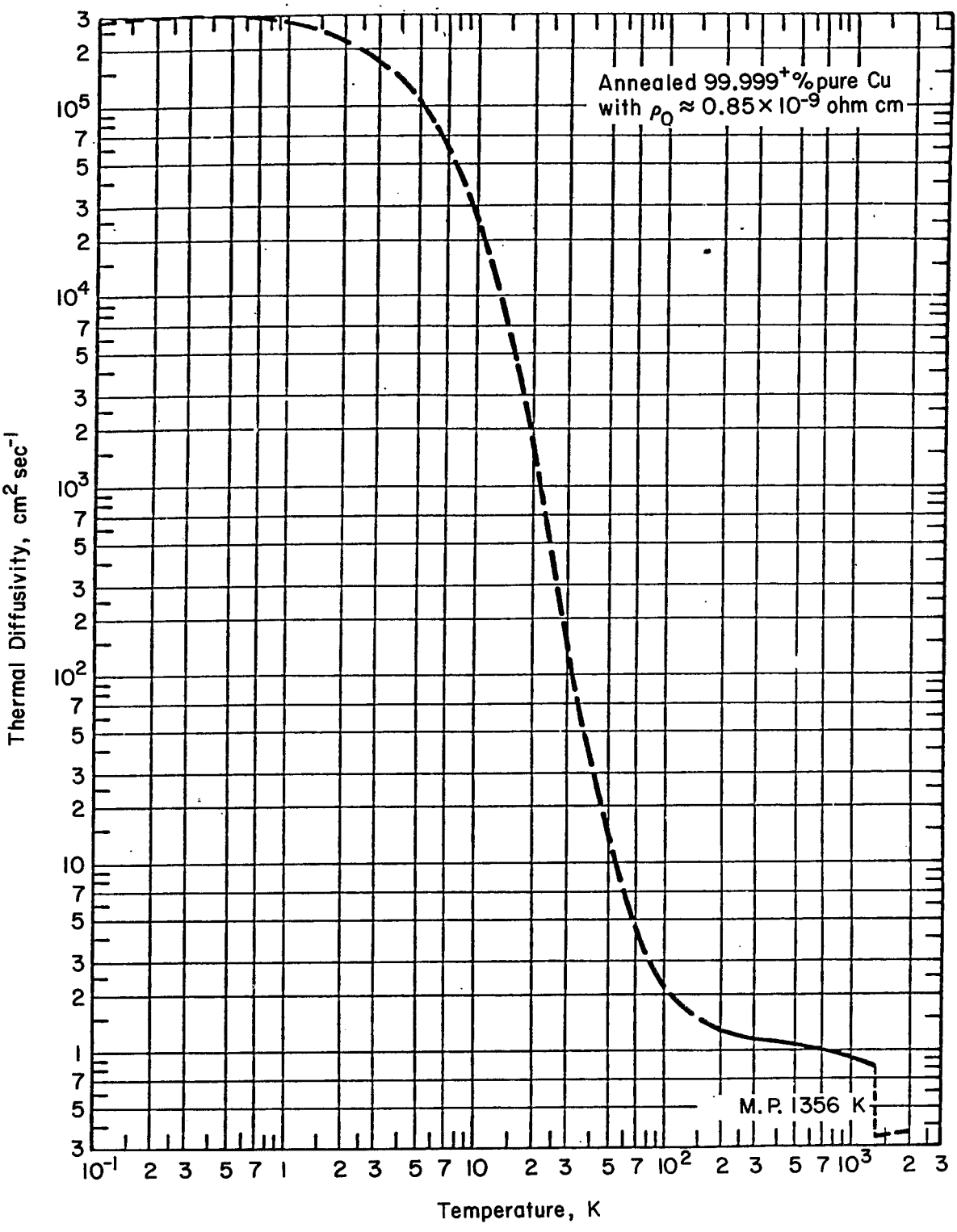
Selected Values for Annealed 99.999+ % Pure Copper with $\rho_o \approx 0.85 \times 10^{-9}$ ohm cm

T, K	α, $cm^2 sec^{-1}$	T, K	α, $cm^2 sec^{-1}$
0.1	280000*	500	1.08
0.5	287000*	600	1.04
1	275000*	700	1.01
5	105000*	800	0.98
10	25200*	900	0.94
15	6200*	1000	0.91
20	1570*	1100	0.89
30	174*	1200	0.85
40	38*	1300	0.82
50	13.6*	(fcc)1350	0.80*
60	6.9*	(l) 1360	0.342*
70	4.3*	1400	0.344*
80	3.1*	1500	0.347*
90	2.5*	1600	0.351*
100	2.1*	1700	0.354*
150	1.48*	1800	0.358*
200	1.28*	1900	0.362*
300	1.15	2000	0.366*
400	1.11		

Data Source and Remarks

Thirty-five sets of experimental data are available over the temperature range 295 to 1284 K. Selected values lie close to the data of Sidles and Danielson (1960, 1953, 1951) [6,7,8], Butler and Inn (1957) [9], Mrozawski, Andrew, Fuul, Sato , Strauss, and Tsuzuku (1963) [10] Moser and Kruger (1963) [11], El-hifini and Chao (1956) [12], Sonnenschein and Winn (1960) [3], and Jenkins and Parker (1961) [4]. It is noted that the selected values are for purer copper than those measured by these authors.

* Calculated or estimated.



Thermal Diffusivity of Copper

THERMAL DIFFUSIVITY OF NIOBIUM

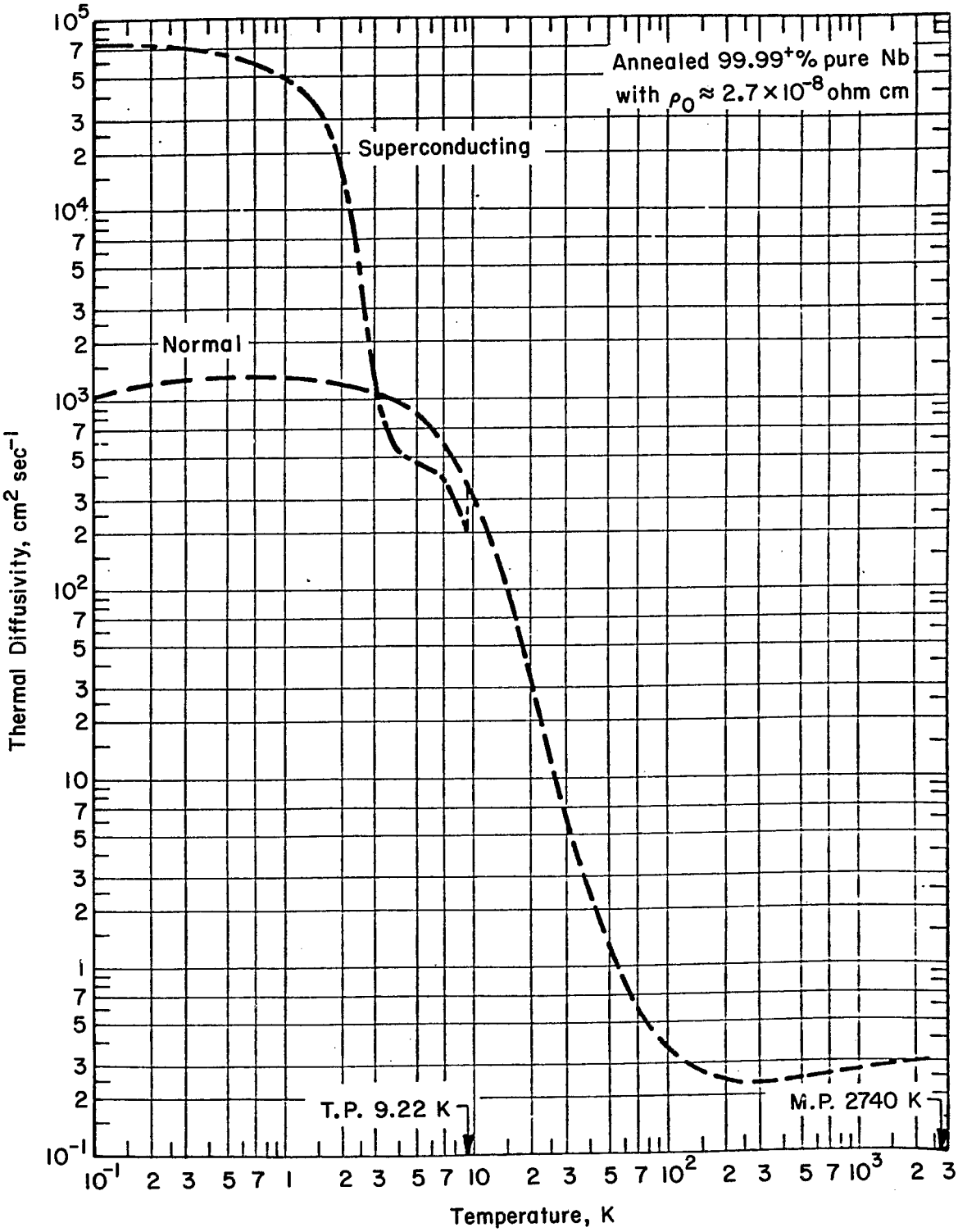
Selected Values for Annealed 99.99+ % Pure Niobium with $\rho_o \approx 2.7 \times 10^{-8}$ ohm cm*

T,K	α, $cm^{-2}sec^{-1}$		T,K	α, $cm^2\,sec^{-1}$
	Normal	Superconducting		
0.1	1020*	75000	100	0.353
1	1290	48000	150	0.264
1.5		33000	200	0.242
2		14000	300	0.234
2.5		4200	400	0.236
3		1260	500	0.241
4		530	600	0.246
5	860	460	700	0.252
6		440	800	0.256
7		380	900	0.261
8		300	1000	0.266
9		210	1100	0.270
9.22		200	1200	0.274
10	310		1300	0.278
15	97		1400	0.281
20	34		1500	0.284
30	6.8		1600	0.287
40	2.5		1700	0.290
50	1.26		1800	0.292
60	0.81		1900	0.294
70	0.59		2000	0.296
80	0.47		2200	0.298
90	0.40		2400	0.300

Data Source and Remarks

No experimental data are available. Selected values are calculated or estimated.

* All values are calculated or estimated.



Thermal Diffusivity of Niobium

THERMAL DIFFUSIVITY OF SILICON

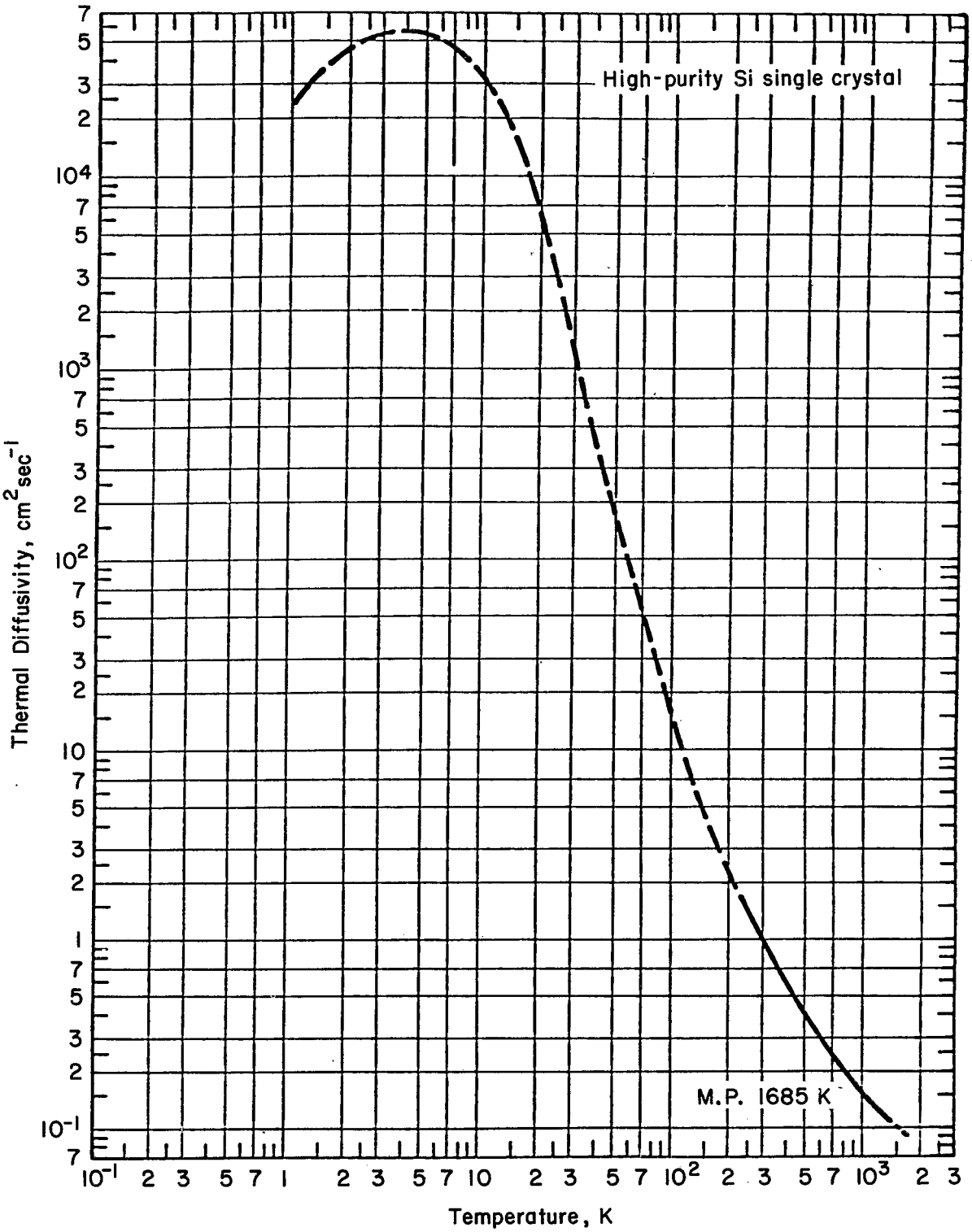
Selected Values for High-Purity Silicon Single Crystal

T,K	α, $cm^2\ sec^{-1}$	T,K	α, $cm^2\ sec^{-1}$
1	24000*	200	2.08*
2	46000*	300	0.88
3	53700*	400	0.55
5	54500*	500	0.40
7	45000*	600	0.30
10	31000*	700	0.24
15	14200*	800	0.20
20	5900*	900	0.168
30	1120*	1000	0.146
40	350*	1100	0.133
50	152*	1200	0.121
60	80*	1300	0.112
70	49*	1400	0.104*
80	31*	1500	0.099*
90	21.3*	1600	0.094*
100	15.1*	1680	0.091*
150	4.4*		

Data Source and Remarks

Four sets of experimental data are available over the temperature range 300 to 1390 K. Selected values from 300 to 1100 K agree well with the data of Shanks, Maycock, Sidles, and Danielson (1963) [18].

* Calculated or estimated.



Thermal Diffusivity of Silicon

THERMAL DIFFUSIVITY OF TIN

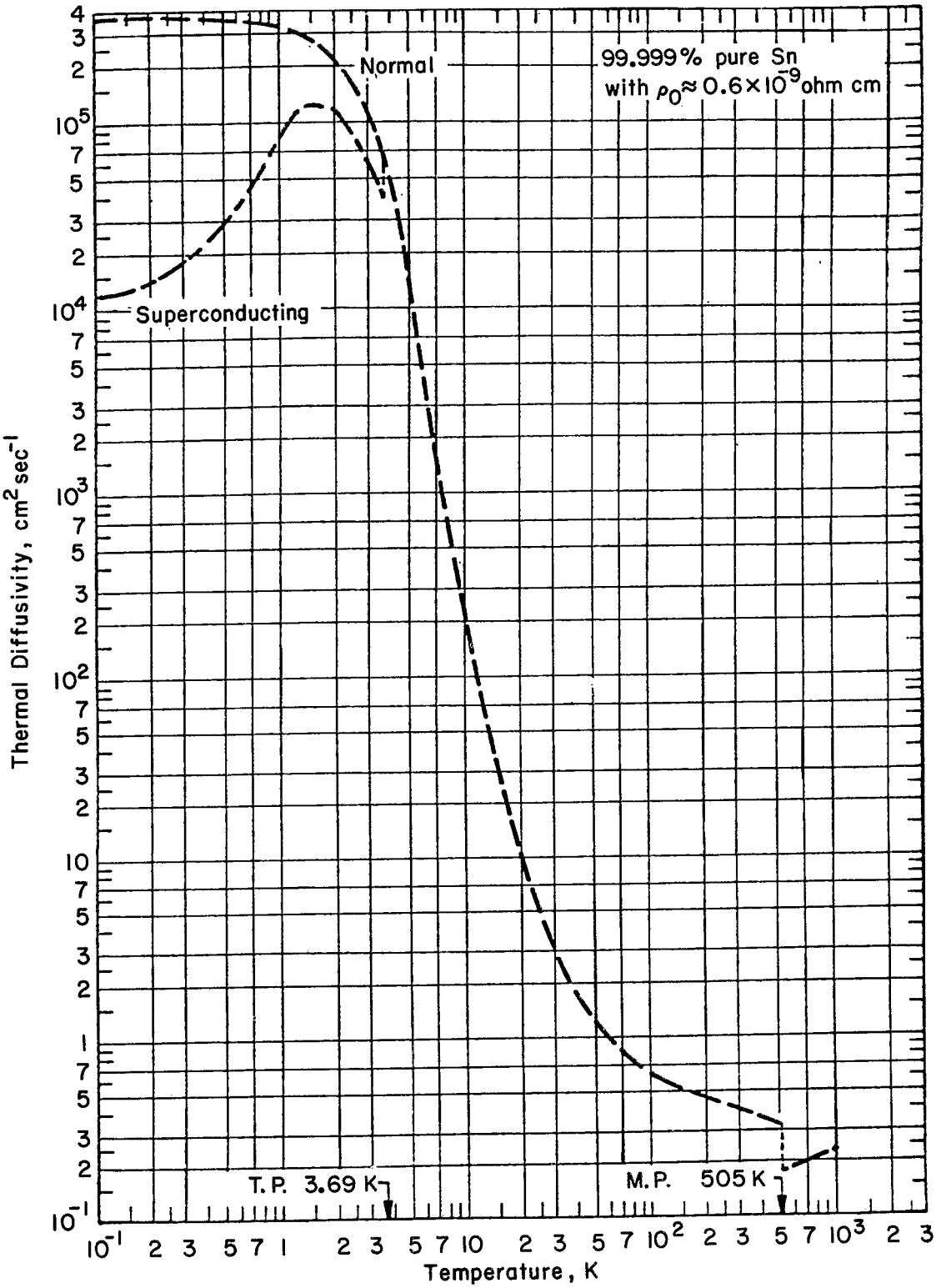
Selected Values for 99.999% Pure Tin with $\rho_o \approx 0.6 \times 10^{-9}$ ohm cm*

T,K	α, $cm^2 sec^{-1}$		T,K	α, $cm^2 sec^{-1}$
	Normal	Superconductivity		
0.1	360000*	12300	50	1.18
0.3		17700	60	0.93
0.5	350000	28400	70	0.80
1	320000	87000	80	0.72
1.5		123000	90	0.66
2	216000	112000	100	0.61
2.5		89000	150	0.51
3	109000	64000	200	0.46
3.5		44000	300	0.40
3.69		39000	400	0.35
4	44000		500	0.32
5	13200		(bct) 504	0.32
10	190		(l) 506	0.176
15	30		600	0.190
20	10		700	0.202
25	4.8		800	0.213
30	3.0		900	0.224
40	1.7		1000	0.235

Data Source and Remarks

No experimental data are available. Selected values are calculated or estimated.

* All values are calculated or estimated.



Thermal Diffusivity of Tin

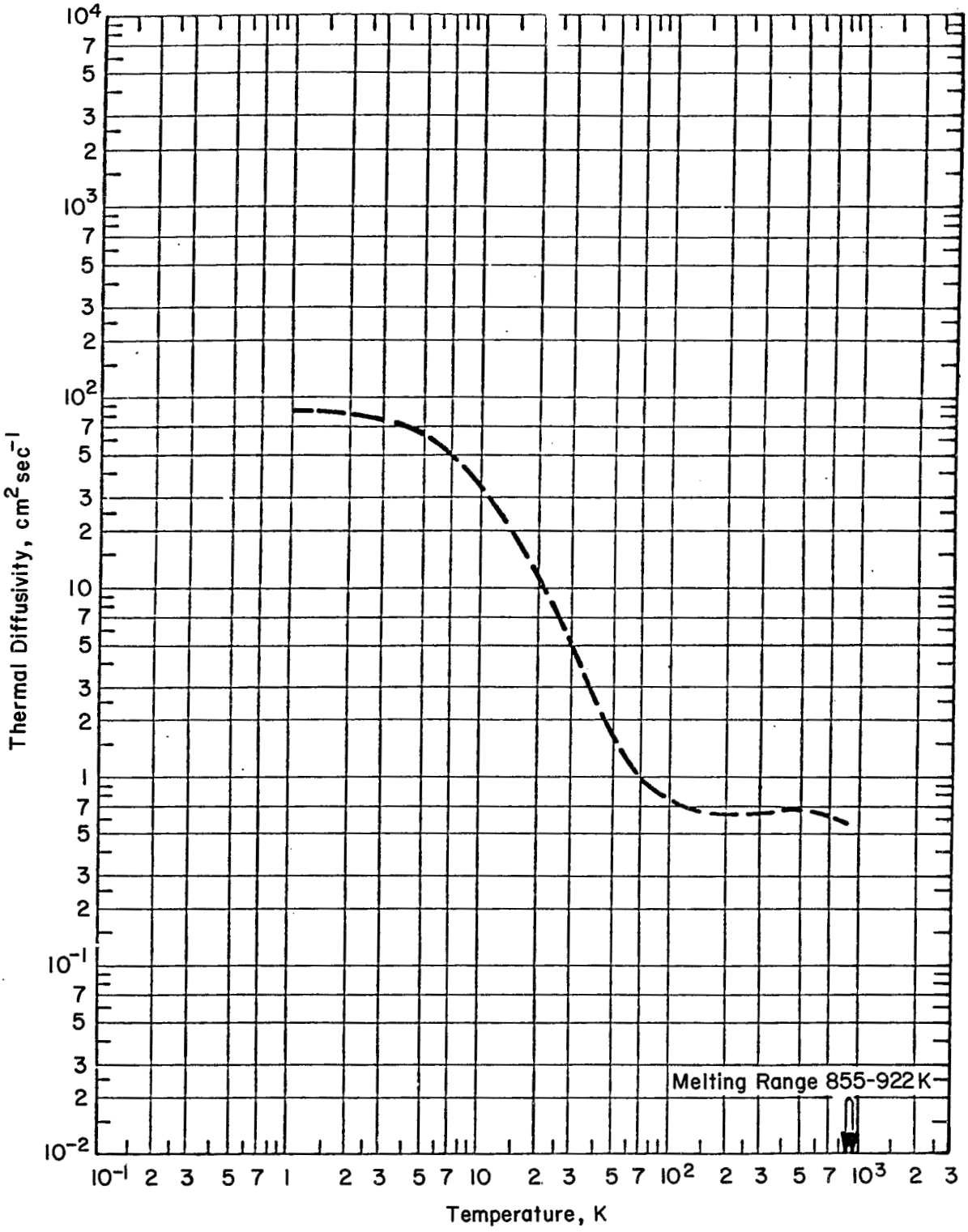
THERMAL DIFFUSIVITY OF ALUMINUM ALLOY 6061-T6*

T, K	α, $cm^2\ sec^{-1}$
1	85*
5	64
10	34
25	7.7
50	1.61
75	0.92
100	0.75
150	0.65
200	0.63
250	0.64
300	0.64
400	0.66
500	0.69
600	0.67
700	0.63
800	0.60
850	0.58

Data Source and Remarks

No experimental data are available. Selected values are calculated or estimated. Heating at moderately high temperature can destroy the "T6" temper and the thermal conductivity will consequently become higher (see for aluminum alloy 7075-T6 for comparison).

* All values calculated or estimated.



Thermal Diffusivity of Aluminum Alloy 6061-T6

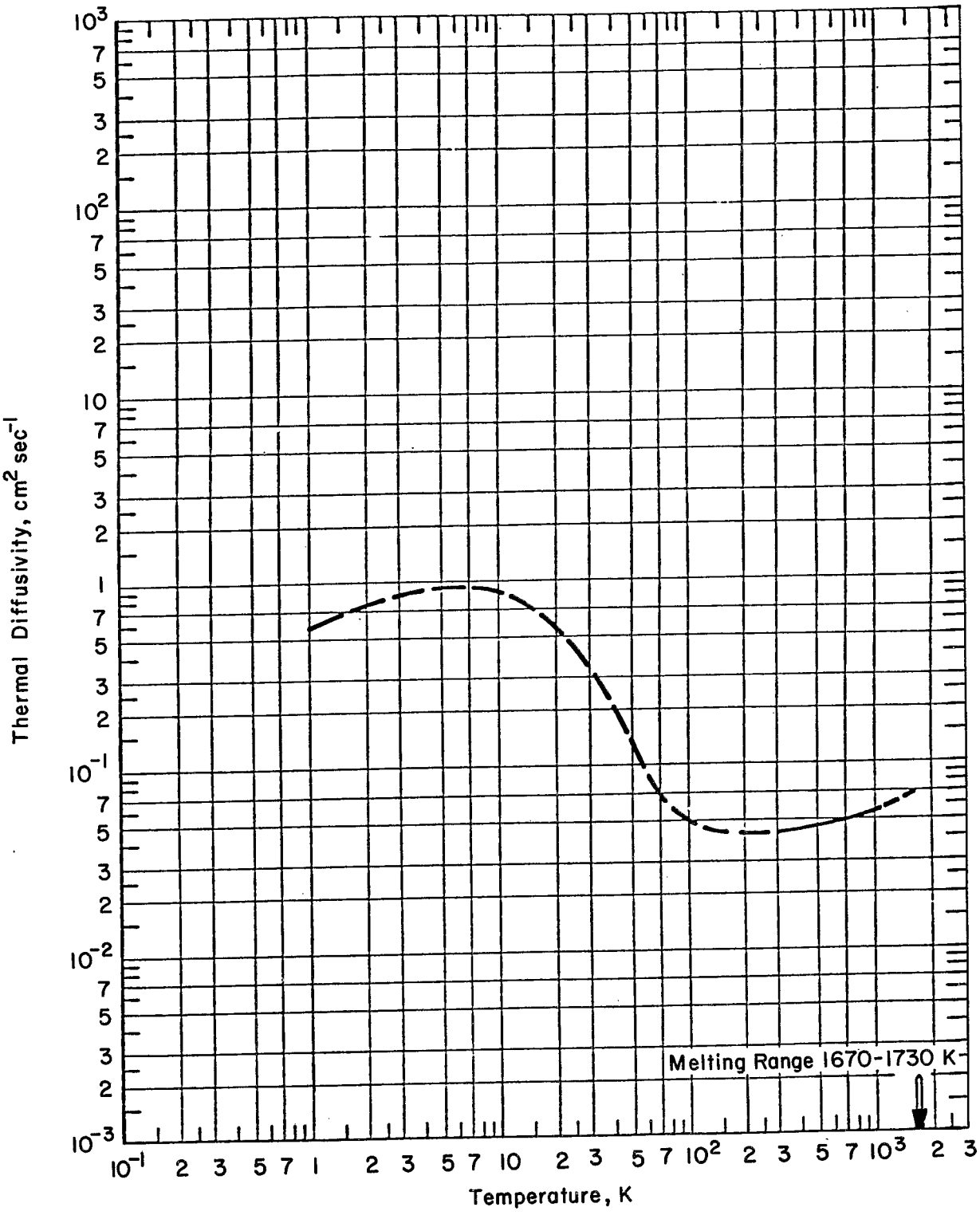
THERMAL DIFFUSIVITY OF STAINLESS STEEL 304 A

T,K	α, $cm^2\ sec^{-1}$	T,K	α, $cm^2\ sec^{-1}$
1	0.56*	300	0.042
5	0.91*	400	0.043
10	0.88*	500	0.044
25	0.44*	600	0.045
50	0.138*	700	0.047
75	0.060*	800	0.049
100	0.047*	900	0.050
150	0.042*	1000	0.051
200	0.041*	1100	0.052
250	0.041*	1200	0.053

Data Source and Remarks

There are two sets of available experimental data from Jenkins and Parker (1961) [4] over the temperature range 293 to 1263 K. Selected values above room temperature are derived from their data with modifications and adjustments.

* Calculated or estimated.



Thermal Diffusivity of Stainless Steel 304A