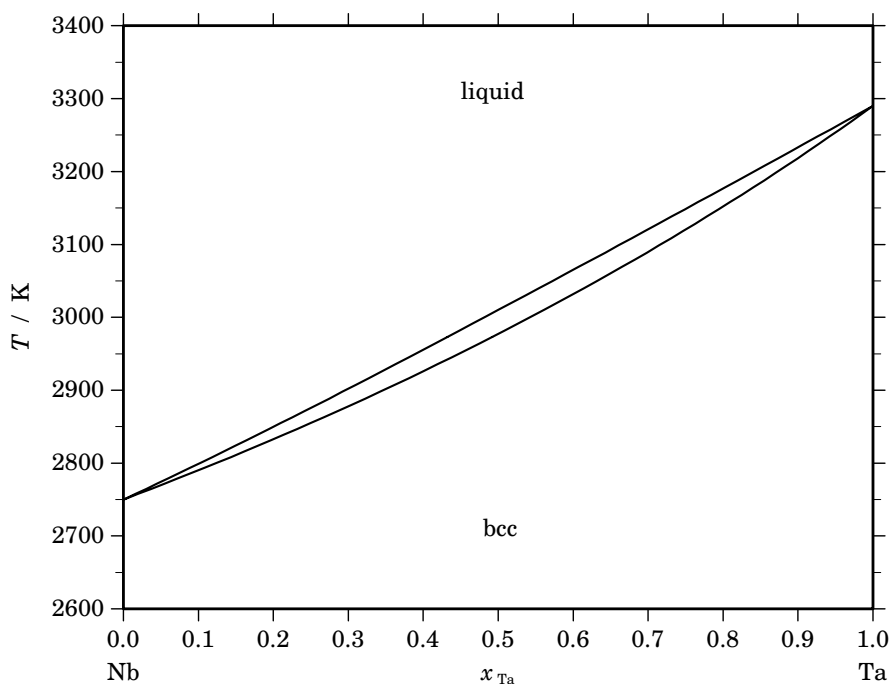


Nb – Ta (Niobium – Tantalum)**Fig. 1.** Calculated phase diagram for the system Nb-Ta.

The phase diagram of the Nb-Ta system is very simple consisting only of the liquid and the bcc phases with complete miscibility for both components. The literature on the Nb-Ta has been reviewed in [1996Kris, 2004Xio] and a thermodynamic dataset has been optimised by [2004Xio] using the element data recommended by SGTE. From the few available investigations on the phase diagram only the data of [1969Rud] are considered to be reliable [1996Kris, 2004Xio] since they are compatible with the currently accepted melting temperatures of the elements. No data for the thermodynamics of Nb-Ta mixtures have been reported in the literature. Based on these limited information the system has been described as an ideal solution in the liquid and as a regular solution in the bcc phase [2004Xio].

Table I. Phases, structures and models.

Phase	Struktur- bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	(Nb,Ta) ₁
bcc	A2	W	cI2	$Im\bar{3}m$	BCC_A2	(Nb,Ta) ₁

Table IIa. Integral quantities for the liquid phase at 3300 K.

x_{Ta}	ΔG_{m} [J/mol]	ΔH_{m} [J/mol]	ΔS_{m} [J/(mol·K)]	G_{m}^{E} [J/mol]	S_{m}^{E} [J/(mol·K)]	ΔC_P [J/(mol·K)]
0.000	0	0	0.000	0	0.000	0.000
0.100	–8920	0	2.703	0	0.000	0.000
0.200	–13730	0	4.161	0	0.000	0.000
0.300	–16761	0	5.079	0	0.000	0.000
0.400	–18466	0	5.596	0	0.000	0.000
0.500	–19019	0	5.763	0	0.000	0.000
0.600	–18466	0	5.596	0	0.000	0.000
0.700	–16761	0	5.079	0	0.000	0.000
0.800	–13730	0	4.161	0	0.000	0.000
0.900	–8920	0	2.703	0	0.000	0.000
1.000	0	0	0.000	0	0.000	0.000

Reference states: Nb(liquid), Ta(liquid)

Table IIb. Partial quantities for Nb in the liquid phase at 3300 K.

x_{Nb}	ΔG_{Nb} [J/mol]	ΔH_{Nb} [J/mol]	ΔS_{Nb} [J/(mol·K)]	G_{Nb}^{E} [J/mol]	S_{Nb}^{E} [J/(mol·K)]	a_{Nb}	γ_{Nb}
1.000	0	0	0.000	0	0.000	1.000	1.000
0.900	–2891	0	0.876	0	0.000	0.900	1.000
0.800	–6123	0	1.855	0	0.000	0.800	1.000
0.700	–9786	0	2.966	0	0.000	0.700	1.000
0.600	–14016	0	4.247	0	0.000	0.600	1.000
0.500	–19019	0	5.763	0	0.000	0.500	1.000
0.400	–25141	0	7.619	0	0.000	0.400	1.000
0.300	–33035	0	10.010	0	0.000	0.300	1.000
0.200	–44160	0	13.382	0	0.000	0.200	1.000
0.100	–63178	0	19.145	0	0.000	0.100	1.000
0.000	– ∞	0	∞	0	0.000	0.000	1.000

Reference state: Nb(liquid)

Table IIc. Partial quantities for Ta in the liquid phase at 3300 K.

x_{Ta}	ΔG_{Ta} [J/mol]	ΔH_{Ta} [J/mol]	ΔS_{Ta} [J/(mol·K)]	G_{Ta}^{E} [J/mol]	S_{Ta}^{E} [J/(mol·K)]	a_{Ta}	γ_{Ta}
0.000	– ∞	0	∞	0	0.000	0.000	1.000
0.100	–63178	0	19.145	0	0.000	0.100	1.000
0.200	–44160	0	13.382	0	0.000	0.200	1.000
0.300	–33035	0	10.010	0	0.000	0.300	1.000
0.400	–25141	0	7.619	0	0.000	0.400	1.000
0.500	–19019	0	5.763	0	0.000	0.500	1.000
0.600	–14016	0	4.247	0	0.000	0.600	1.000
0.700	–9786	0	2.966	0	0.000	0.700	1.000
0.800	–6123	0	1.855	0	0.000	0.800	1.000
0.900	–2891	0	0.876	0	0.000	0.900	1.000
1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Ta(liquid)

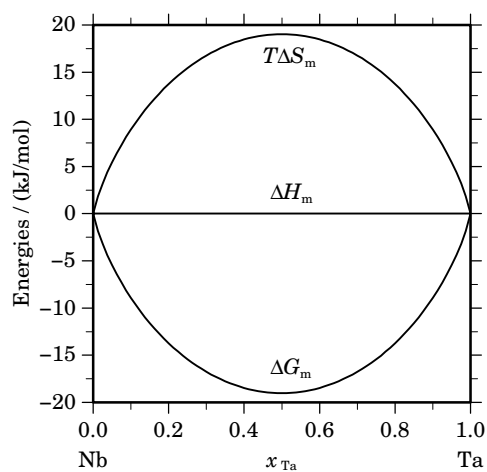


Fig. 2. Integral quantities of the liquid phase at $T=3300$ K.

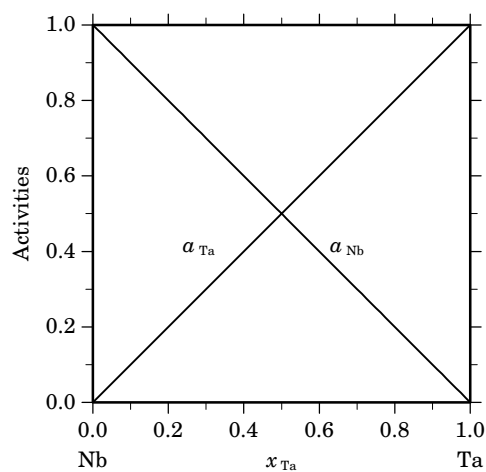


Fig. 3. Activities in the liquid phase at $T=3300$ K.

Table IIIa. Integral quantities for the stable phases at 2600 K.

Phase	x_{Ta}	ΔG_m [J/mol]	ΔH_m [J/mol]	ΔS_m [J/(mol·K)]	G_m^E [J/mol]	S_m^E [J/(mol·K)]	ΔC_P [J/(mol·K)]
bcc	0.000	0	0	0.000	0	0.000	0.000
	0.100	-6911	117	2.703	117	0.000	0.000
	0.200	-10610	208	4.161	208	0.000	0.000
	0.300	-12933	273	5.079	273	0.000	0.000
	0.400	-14238	312	5.596	312	0.000	0.000
	0.500	-14660	325	5.763	325	0.000	0.000
	0.600	-14238	312	5.596	312	0.000	0.000
	0.700	-12933	273	5.079	273	0.000	0.000
	0.800	-10610	208	4.161	208	0.000	0.000
	0.900	-6911	117	2.703	117	0.000	0.000
	1.000	0	0	0.000	0	0.000	0.000

Reference states: Nb(bcc), Ta(bcc)

Table IIIb. Partial quantities for Nb in the stable phases at 2600 K.

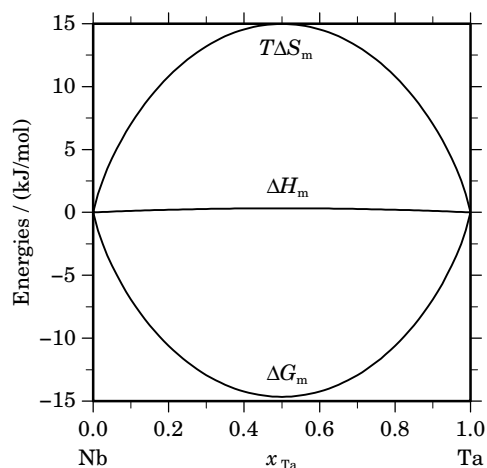
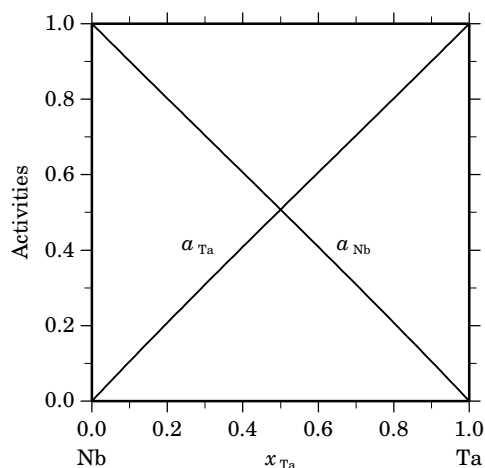
Phase	x_{Nb}	ΔG_{Nb} [J/mol]	ΔH_{Nb} [J/mol]	ΔS_{Nb} [J/(mol·K)]	G_{Nb}^E [J/mol]	S_{Nb}^E [J/(mol·K)]	a_{Nb}	γ_{Nb}
bcc	1.000	0	0	0.000	0	0.000	1.000	1.000
	0.900	-2265	13	0.876	13	0.000	0.901	1.001
	0.800	-4772	52	1.855	52	0.000	0.802	1.002
	0.700	-7594	117	2.966	117	0.000	0.704	1.005
	0.600	-10835	208	4.247	208	0.000	0.606	1.010
	0.500	-14660	325	5.763	325	0.000	0.508	1.015
	0.400	-19341	467	7.619	467	0.000	0.409	1.022
	0.300	-25391	636	10.010	636	0.000	0.309	1.030
	0.200	-33962	831	13.382	831	0.000	0.208	1.039
	0.100	-48725	1051	19.145	1051	0.000	0.105	1.050
	0.000	$-\infty$	1298	∞	1298	0.000	0.000	1.062

Reference state: Nb(bcc)

Table IIIc. Partial quantities for Ta in the stable phases at 2600 K.

Phase	x_{Ta}	ΔG_{Ta} [J/mol]	ΔH_{Ta} [J/mol]	ΔS_{Ta} [J/(mol·K)]	G_{Ta}^E [J/mol]	S_{Ta}^E [J/(mol·K)]	a_{Ta}	γ_{Ta}
bcc	0.000	$-\infty$	1298	∞	1298	0.000	0.000	1.062
	0.100	-48725	1051	19.145	1051	0.000	0.105	1.050
	0.200	-33962	831	13.382	831	0.000	0.208	1.039
	0.300	-25391	636	10.010	636	0.000	0.309	1.030
	0.400	-19341	467	7.619	467	0.000	0.409	1.022
	0.500	-14660	325	5.763	325	0.000	0.508	1.015
	0.600	-10835	208	4.247	208	0.000	0.606	1.010
	0.700	-7594	117	2.966	117	0.000	0.704	1.005
	0.800	-4772	52	1.855	52	0.000	0.802	1.002
	0.900	-2265	13	0.876	13	0.000	0.901	1.001
	1.000	0	0	0.000	0	0.000	1.000	1.000

Reference state: Ta(bcc)

**Fig. 4.** Integral quantities of the stable phases at $T=2600$ K.**Fig. 5.** Activities in the stable phases at $T=2600$ K.

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