N – Nb (Nitrogen – Niobium)

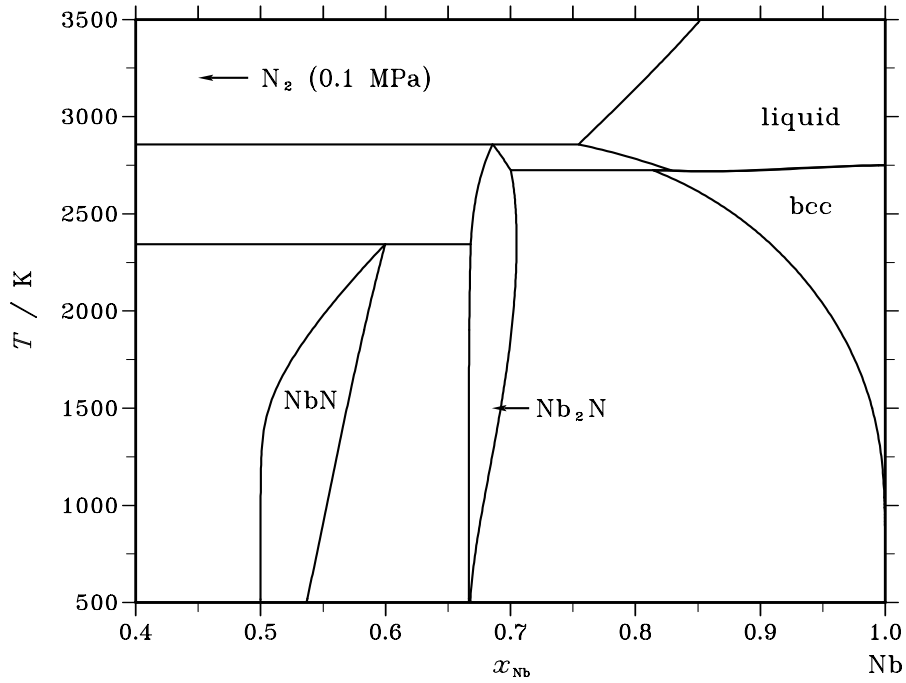

Fig. 1. Calculated phase diagram for the system N-Nb.

N and Nb are both alloying elements in steels and other alloys. Nb is a strong carbide and nitride former and this is used for hardening together with other carbide/nitride formers. There are two stable nitrides, the hexagonal Nb_2N and the cubic NbN. Both are modelled as interstitial solutions of N in hcp and fcc, respectively. The assessment has been reported by [96Hua].

Table I. Phases, structures and models.

Phase	Struktur-bericht	Prototype	Pearson symbol	Space group	SGTE name	Model
liquid					LIQUID	$(N,Nb)_1$
NbN	$B1$	NaCl	$cF8$	$Fm\overline{3}m$	FCC_A1	$Nb_1(N,\Box)_1$
Nb_2N	$\cdots$	V_2N	$hP9$	$P\overline{3}1m$	HCP_A3	$Nb_2(N,\Box)_1$
bcc	$A2$	W	$cI2$	$Im\overline{3}m$	BCC_A2	$Nb_1(N,\Box)_3$

Table II. Invariant reactions.

Reaction	Type	T / K	Compositions / x_{Nb}			$\Delta_r H$ / (J/mol)
gas + liquid $\rightleftharpoons$ Nb_2N	gas-peritectic	2857.6	0.000	0.755	0.686	−68205
Nb_2N + liquid $\rightleftharpoons$ bcc	peritectic	2724.4	0.700	0.828	0.814	−23207
liquid $\rightleftharpoons$ bcc	congruent	2718.9	0.856	0.856		−29364
gas + Nb_2N $\rightleftharpoons$ NbN	gas-peritectoid	2343.6	0.000	0.668	0.600	−15508

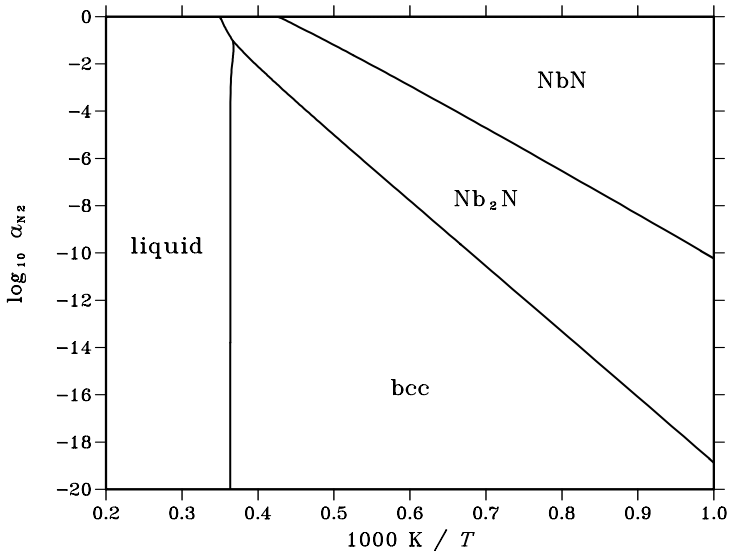

Fig. 2. Calculated temperature-activity phase diagram. Reference state: $\frac{1}{2}N_2$(gas, 0.1 MPa).

References

[96Hua] W. Huang: Metall. Mater. Trans. A **27A** (1996) 3591–3600.