

# Ni-Tb (Nickel-Terbium)

H. Okamoto

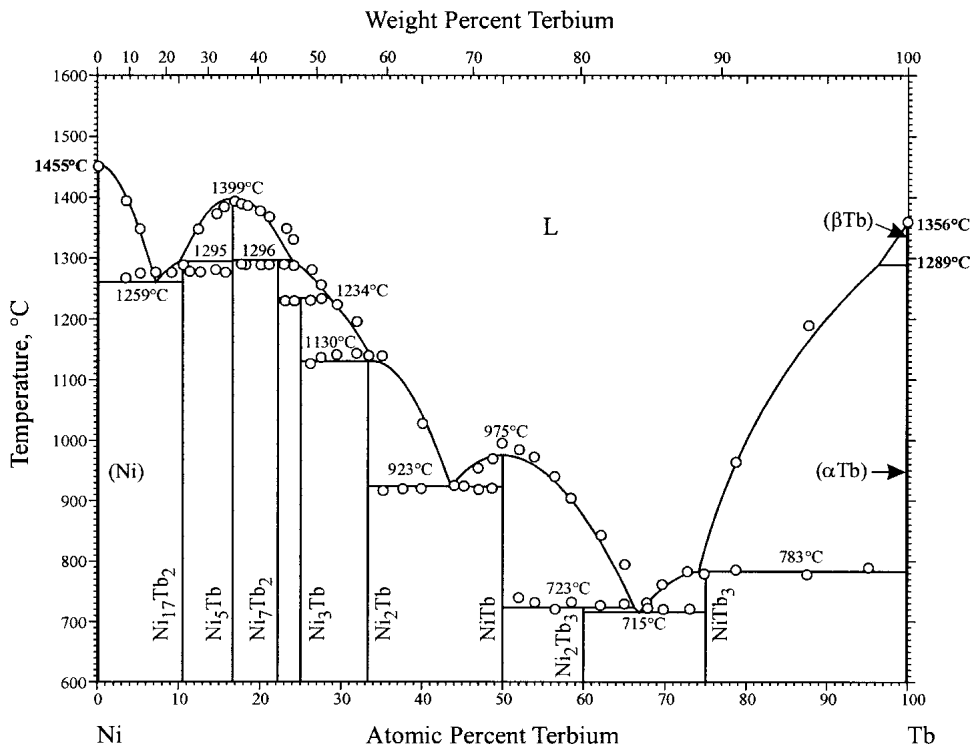
The Ni-Tb phase diagram was not included in [Massalski2] due to lack of data.

Two Ni-Tb phase diagrams were reported in 2004, first by [2004Ron] (Fig. 1) and then by [2004Yao] (Fig. 2). The

data points in Fig. 1 were obtained by differential thermal analysis (DTA) and electromotive force (EMF) measurements, and the phase boundaries were determined by thermodynamic optimization. The data points in Fig. 2 were

**Table 1 Ni-Tb Crystal structure data [Massalski2]**

Phase	Composition, at.% Tb	Pearson symbol	Space group	Strukturbericht designation	Prototype
(Ni)	0	<i>cF4</i>	<i>Fm</i> $\bar{3}$ <i>m</i>	A1	Cu
Ni <sub>17</sub> Tb <sub>2</sub>	10.5	<i>hP38</i>	<i>P6</i> <sub>3</sub> / <i>mmc</i>	...	Tb <sub>2</sub> Ni <sub>17</sub>
Ni <sub>5</sub> Tb	16.7	<i>hP6</i>	<i>P6</i> / <i>mmc</i>	<i>D2</i> <sub>d</sub>	CaCu <sub>5</sub>
Ni <sub>7</sub> Tb <sub>2</sub>	22.2	<i>hR54</i>	<i>R</i> $\bar{3}$ <i>m</i>	...	Gd <sub>2</sub> Co <sub>7</sub>
		<i>hP36</i>	<i>P6</i> <sub>3</sub> / <i>mmc</i>	...	Ce <sub>2</sub> Ni <sub>7</sub>
Ni <sub>3</sub> Tb	25	<i>hR24</i>	<i>R</i> $\bar{3}$ <i>m</i>	...	PuNi <sub>3</sub>
Ni <sub>2</sub> Tb	33.3	<i>cF24</i>	<i>Fd</i> $\bar{3}$ <i>m</i>	C15	Cu <sub>2</sub> Mg
NiTb	50	<i>oP24</i>	<i>Pnma</i>	...	...
		<i>mP24</i>	<i>P2</i> <sub>1</sub> / <i>m</i>	...	...
		<i>oC8</i>	<i>Cmcm</i>	<i>B</i> <sub>f</sub>	CrB
Ni <sub>2</sub> Tb <sub>3</sub>	60	<i>mC20</i>	<i>C2</i> / <i>m</i>	...	Dy <sub>3</sub> Ni <sub>2</sub>
NiTb <sub>3</sub>	75	<i>oP16</i>	<i>Pnma</i>	<i>DO</i> <sub>11</sub>	Fe <sub>3</sub> C
(βTb)	100	<i>cI2</i>	<i>Im</i> $\bar{3}$ <i>m</i>	A2	W
(αTb)	100	<i>hP2</i>	<i>P6</i> <sub>3</sub> / <i>mmc</i>	A3	Mg



**Fig. 1** Ni-Tb phase diagram reported by [2004Ron]

Section III: Supplemental Literature Review

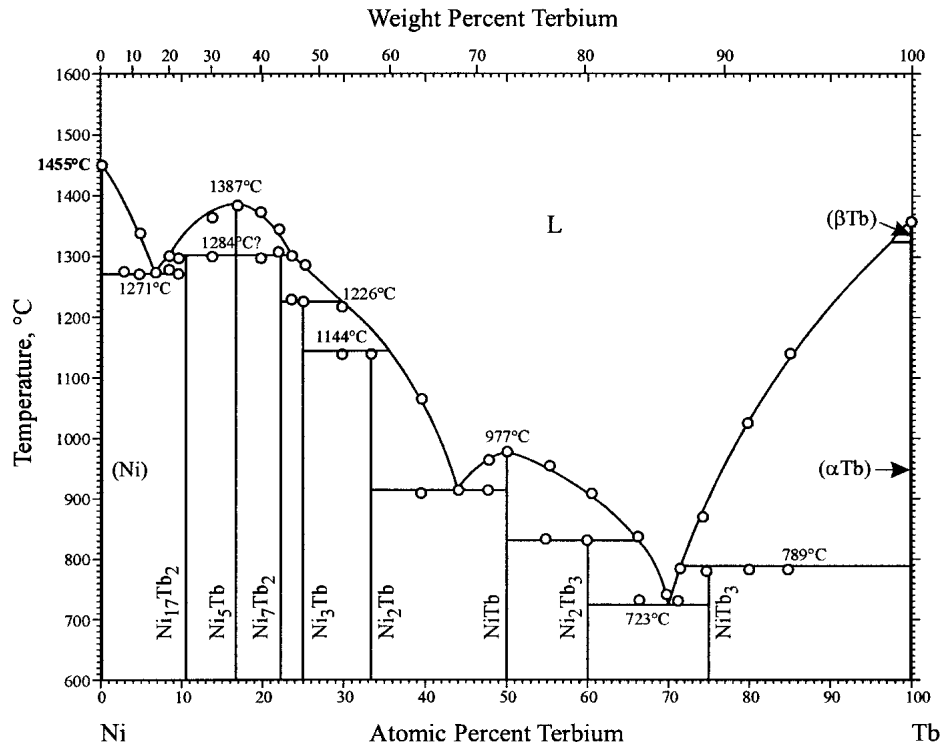


Fig. 2 Ni-Tb phase diagram reported by [2004Yao]

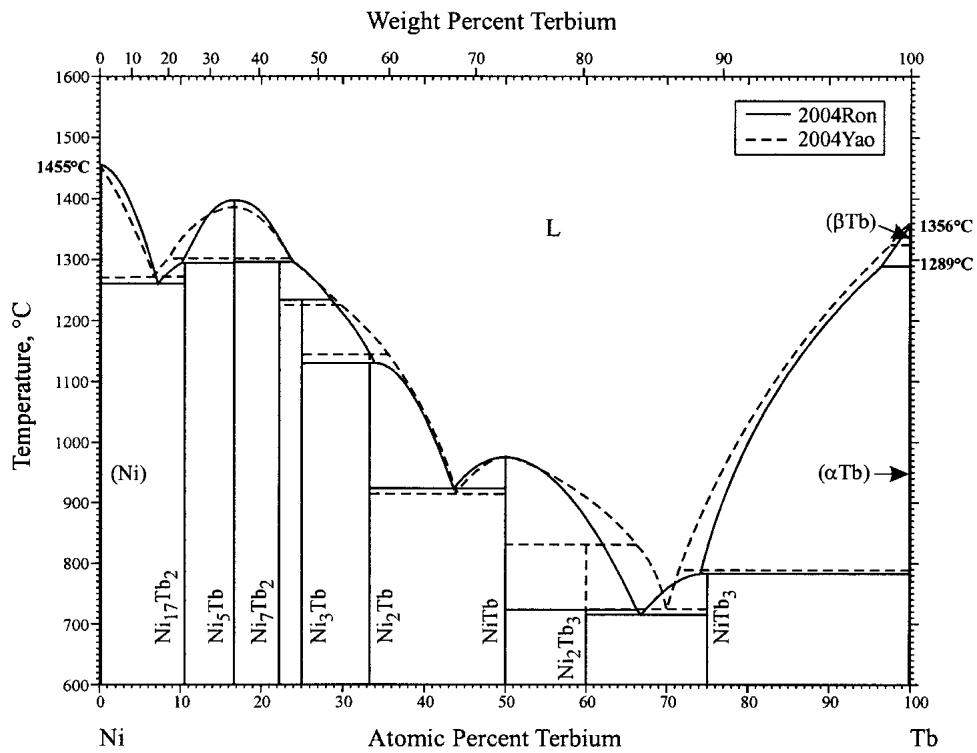


Fig. 3 Comparison of Fig. 1 and 2

obtained by DTA. In Fig. 2, the peritectic formation temperatures of  $\text{Ni}_{17}\text{Tb}_2$  and  $\text{Ni}_7\text{Tb}_2$  are both labeled 1284 °C, but on the outside temperature scale they appear as ~1304 °C .

These two phase diagrams are compared in Fig. 3. General trends are in good agreement, but a substantial (>100 °C) difference is observed in the peritectic formation temperature of  $\text{Ni}_2\text{Tb}_3$ .

Table 1 shows Ni-Tb crystal structure data given in [Massalski2].

## References

- 2004Ron:** Q. Rong and H.J. Schaller, On the Constitution and Thermodynamics of Ni-Tb Alloys, *J. Alloys Compd.*, Vol 365, 2004, p 188-196
- 2004Yao:** Q. Yao, H. Zhou, and Y. Wang, Tb-Ni Binary Alloy Phase Diagram, *The 12th National Symposium on Phase Diagram, Materials, Design, and Their Applications*, China, 2004, p 177-179 (in Chinese)