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Fe-Nb-Ti (Iron-Niobium-Titanium)

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[2002Rag] reviewed the two isothermal sections for Ti-rich alloys at 750 and 600 °C determined by [1999Shu]. Recently, [2005Xu] reported a full isothermal section at 900 °C for this ternary system, which depicts no ternary phases.

Binary Systems

The Fe-Nb phase diagram [1993Bej] has two intermediate phases: Fe_2Nb ($C14$, $MgZn_2$-type hexagonal) and Fe_7Nb_6 (μ; $D8_5$, Fe_7W_6-type rhombohedral). The Fe-Ti phase diagram [1998Dum] has two intermediate phases: Fe_2Ti ($C14$, $MgZn_2$-type hexagonal) and FeTi ($B2$, CsCl-type cubic). In the Nb-Ti phase diagram [Massalski2], βTi and Nb form a continuous body-centered cubic (bcc) solid solution at higher temperatures. αTi, which forms at lower temperatures, dissolves a limited amount of Nb.

Ternary Isothermal Section

With starting metals of 99.5 wt.% Fe, 99.8 wt.% Nb and 99.9 wt.% Ti, [2005Xu] prepared Fe-Nb-Ti diffusion couples, which were annealed at 900 °C for 432-260 h and quenched in water. The phase equilibria were studied by optical microscopy and electron probe microanalysis. The measured compositions of the coexisting phases were listed. The isothermal section at 900 °C constructed by [2005Xu] is shown in Fig. 1. No ternary compound was found at 900 °C. The solubility of Nb in FeTi is 6 at.% and of Ti in Fe_7Nb_6 is 23.6 at.%. Fe_2Nb and Fe_2Ti form a continuous solid solution.

References

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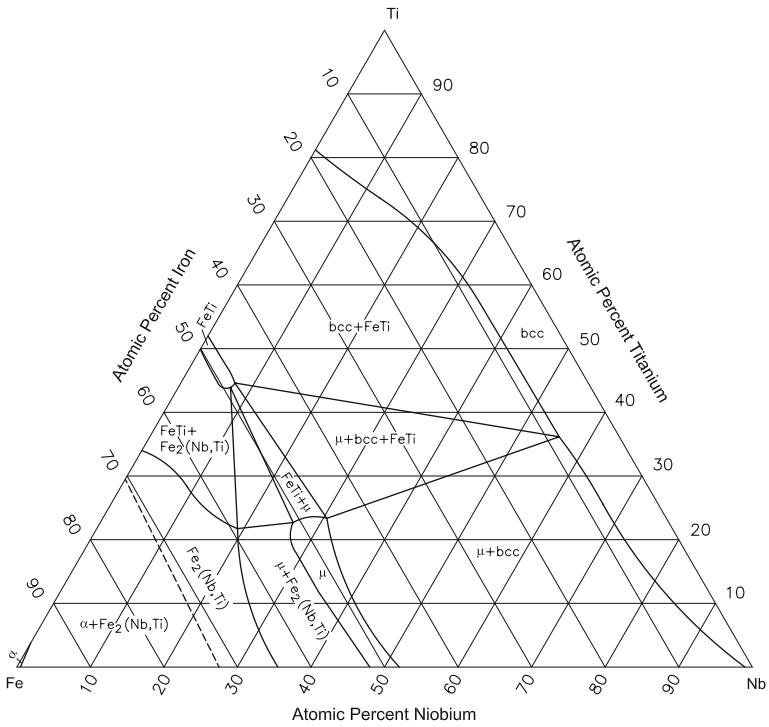

Fig. 1 Fe-Nb-Ti isothermal section at 900 °C [2005Xu]

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