

Fe-Tb-V (Iron-Terbium-Vanadium)

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Recently, [2009Yao] determined an isothermal section for this system at 700 °C, which depicts the ternary compound $\text{TbFe}_{12-x}\text{V}_x$ ($1.8 \leq x \leq 3$).

Binary Systems

The Fe-Tb phase diagram [Massalski2] depicts the following compounds: $\alpha\text{Fe}_{17}\text{Tb}_2$ ($\text{Th}_2\text{Zn}_{17}$ -type rhombohedral), $\beta\text{Fe}_{17}\text{Tb}_2$ ($\text{Th}_2\text{Ni}_{17}$ -type hexagonal), $\text{Fe}_{23}\text{Tb}_6$ ($D8_a$, $\text{Mn}_{23}\text{Th}_6$ -type cubic), Fe_3Tb (Be_3Nb -type rhombohedral)

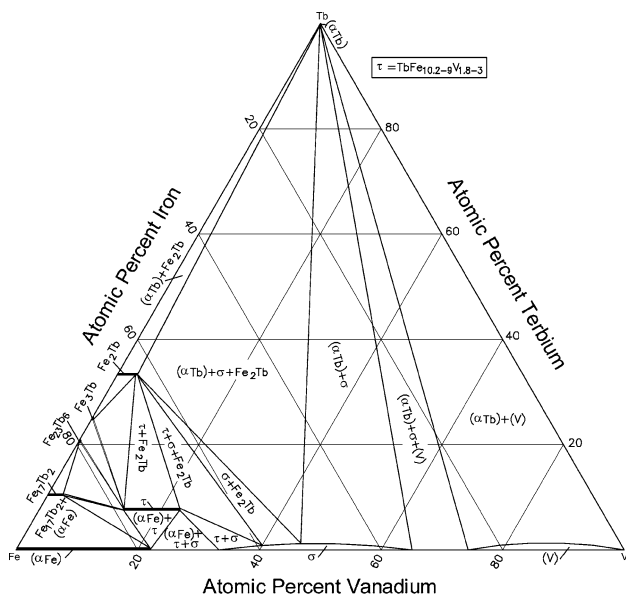


Fig. 1 Fe-Tb-V isothermal section at 700 °C [2009Yao]. Narrow two-phase regions are omitted

and Fe_2Tb ($C15$, MgCu_2 -type cubic). The Fe-V phase diagram [1984Smi] depicts one intermediate phase σ ($D8_b$, σCrFe -type tetragonal). The Tb-V phase diagram [Massalski2] depicts a liquid miscibility gap and no intermediate phases.

Ternary Isothermal Section

With starting metals of 99.9% purity, [2009Yao] arc-melted under Ar atm 85 binary and ternary alloys. The samples were given a final anneal at 700 °C for >10 days and quenched in ice-water mixture. The phase equilibria were studied with scanning electron microscopy, differential thermal analysis and x-ray powder diffraction. The isothermal section constructed by [2009Yao] at 700 °C is shown in Fig. 1. The ternary compound $\text{TbFe}_{12-x}\text{V}_x$ ($1.8 \leq x \leq 3$) [1988DeM] (denoted here as τ) is present. It has the ThMn_{12} -type tetragonal structure. The other ternary compound $\text{Tb}_3(\text{Fe},\text{V})_{29}$ reported by [1988DeM] was not found at 700 °C, but its presence was confirmed by [2009Yao] in samples annealed at 1000 °C. The solubility of V in $\text{Fe}_{17}\text{Tb}_2$ and Fe_2Tb was 2.5 and 3.3 at.% [2009Yao].

References

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- 2009Yao: Q. Yao, H. Zhou, X. Hu, H. Wang, and C. Tang, The 700 °C Isothermal Section of Tb-Fe-V Ternary System, *J. Alloys Compd.*, 2009, **485**, p 209-211