Fe-V-Zn (Iron-Vanadium-Zinc)

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Recently, [2010Wu] determined an isothermal section for this ternary system at 450 °C, which depicts a ternary compound T in the Zn-rich region.

Binary Systems

The Fe-V phase diagram depicts one intermediate phase σ (31-66 at.% V; $D8_b$, σCrFe -type tetragonal). In the Fe-Zn system, the intermediate phases are: Γ ($\text{Fe}_3\text{Zn}_{10}$; Cu_5Zn_8 -type cubic), Γ_1 ($\text{Fe}_{11}\text{Zn}_{40}$; cubic), δ (FeZn_{10} -type hexagonal) and ζ (CoZn_{13} -type monoclinic). The V-Zn system has two established intermediate phases: V_4Zn_5 (tetragonal) and VZn_3 ($L1_2$, AuCu_3 -type cubic). See [Massalski2] for the above diagrams.

Ternary Isothermal Section

With starting metals of purity >99.99%, [2010Wu] melted 21 Zn-rich alloys in a corundum crucible placed

inside an evacuated quartz tube. The alloys were given a final anneal at 450 °C for 45 days and quenched in water. The phase equilibria were studied with x-ray powder diffraction and scanning electron microscopy coupled with energy/wave dispersive spectroscopy. The isothermal section at 450 °C constructed by [2010Wu] for Zn-rich alloys is shown in Fig. 1. A ternary phase T of unknown structure is present in a composition range of 5.6-15.5 Fe, 1.4-4.5 V and 82.3-92.2 Zn (at.%). The solubility of V in Γ , Γ_1 and δ is up to 1.8, 1.3 and 0.5 at.% respectively. The solubility of Zn in the Fe-V σ phase is up to 7.8 at.% [2010Wu].

Reference

2010Wu: C. Wu, X. Su, D. Liu, X. Wang, F. Yin, Z. Zhu, and Z. Li, Experimental Investigation of the Zn-Fe-V System at 450 °C. *Int. J. Mater. Res.*, 2010, **101**(12), p 1476-1483

Fig. 1 Fe-V-Zn isothermal section at 450 °C in Zn-rich alloys [2010Wu]