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Fe-Ti-Zn (Iron-Titanium-Zinc)

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The previous review of this system by [2002Rag] presented a metastable isothermal section at 450 °C from the studies of [1997Glo]. Recently, [2007Tan] determined an isothermal section at the same temperature under equilibrium conditions.

Binary Systems

In the Fe-Ti phase diagram [Massalski2], there are two intermediate phases: Fe_2Ti ($C14$, $MgZn_2$-type hexagonal) and FeTi ($B2$, CsCl-type cubic). The intermediate phases in the Fe-Zn system are: Γ (Fe_3Zn_{10}; Cu_5Zn_8-type cubic), Γ_1 ($Fe_{11}Zn_{40}$; cubic, space group $F\bar{4}3m$, 408 atoms/cell), δ ($FeZn_{10}$; $FeZn_{10}$-type hexagonal), and ζ ($CoZn_{13}$-type monoclinic). In the Ti-Zn system, the intermediate phases in the Zn-rich region are: $TiZn_{16}$ (orthorhombic), $TiZn_8$, and $TiZn_3$ ($L1_2$, $AuCu_3$-type cubic) [2007Tan].

Ternary Isothermal Section

With starting metals of 99.99% purity, [2007Tan] melted 21 alloy compositions with Zn content ranging from 65 to 93%. The samples were annealed at 450 °C for 30 days and quenched in water. The phase equilibria were studied with x-ray diffraction and a scanning electron microscope with an energy dispersive spectroscopic attachment. The isothermal section at 450 °C constructed by [2007Tan] is shown in Fig. 1. The metastable section determined by [1997Glo] shows a large area of Γ_1 extending up to 12 at.% Ti. A decrease in the extent of the Γ_1 region with long annealing times was noted by [1997Glo]. The section in Fig. 1 [2007Tan] shows a much smaller region of Γ_1 (in line with the equilibrium conditions), but also the presence of a ternary phase (denoted T by [2007Tan] and Γ_1' here). The structural details of Γ_1' were not resolved. No ternary phase was reported by [1997Glo].

References

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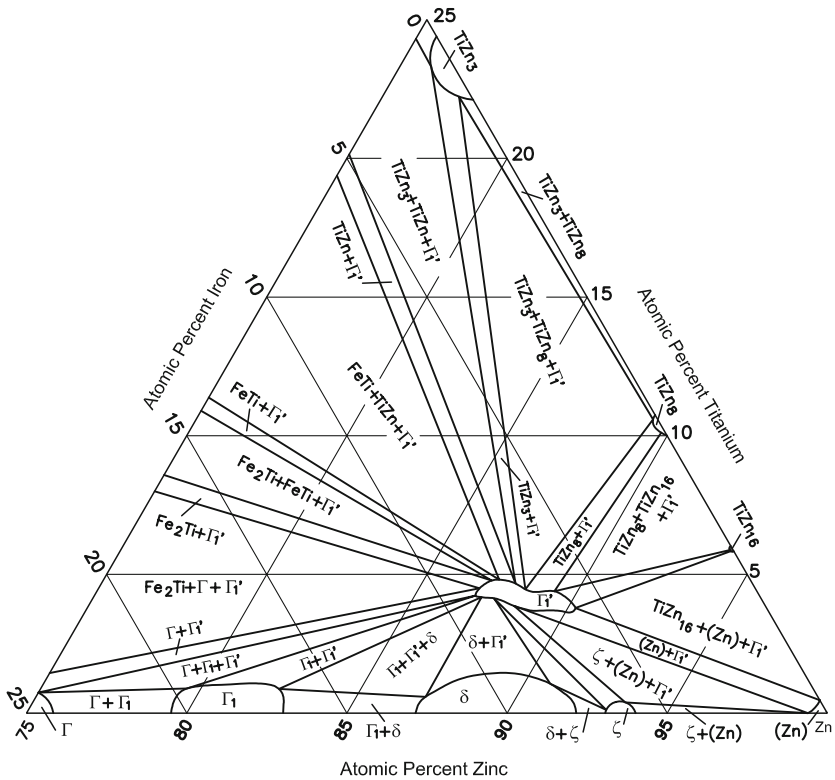

Fig. 1 Fe-Ti-Zn isothermal section at 450 °C [2007Tan]