

Fe-Sn-Zn (Iron-Tin-Zinc)

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Recently, [2003Tan] determined an isothermal section for Zn-rich alloys of this system at 450 °C.

Binary Systems

In the Fe-Sn system, the intermediate phases are: Fe₅Sn₃ (B8₂, Ni₂In-type hexagonal), Fe₃Sn₂ (rhombohedral), FeSn (B35, CoSn-type hexagonal) and FeSn₂ (C16, CuAl₂-type tetragonal). The Fe-Zn phase diagram [2003Rag] exhibits a γ loop, extensive solubility of Zn in the body-centered cubic (bcc) Fe (α), and four intermediate phases: Fe₃Zn₁₀ (denoted Γ ; 68.5-82.5 at.% Zn, Cu₅Zn₈-type cubic), Fe₁₁Zn₄₀ (denoted Γ_1 ; 75-81 at.% Zn, cubic), FeZn₁₀ (denoted δ ; 86.5-91.8 at.% Zn, hexagonal), and FeZn₁₃ (denoted ζ ; 92.8-94 at.% Zn, CoZn₁₃-type monoclinic). The Sn-Zn phase diagram [Massalski2] is a simple eutectic system with little terminal solubility between the components.

Ternary Isothermal Section

With starting metals of 99.99% purity, [2003Tan] melted in evacuated quartz tubes 12 ternary alloys containing up to

23 at.% Fe and up to 9 at.% Sn. The final anneal was at 450 °C for 10 days, followed by water quenching. The phase equilibria were studied by optical and scanning electron microscopy, energy dispersive spectroscopy, and x-ray powder diffraction. The measured compositions of the coexisting phases were listed. In alloys with ≥ 6 at.% Sn, metallic glass was formed from the liquid phase during quenching. The isothermal section at 450 °C constructed by [2003Tan] is redrawn in Fig. 1 to agree with the accepted binary data. The liquid (as metallic glass in the quenched condition) contained ~0% Fe, when in equilibrium with ($\zeta + \delta$) and 3.0 at.% Fe, when in equilibrium with ($\delta + \Gamma_1$).

References

- 2003Rag:** V. Raghavan, Fe-Zn (Iron-Zinc), *J. Phase Equilib.*, 2003, **24**(6), p 544-545
2003Tan: N.Y. Tang, X. Su, and X.B. Yu, A Study of the Zn-Rich Corner of the Zn-Fe-Sn System, *J. Phase Equilib.*, 2003, **24**(6), p 528-532

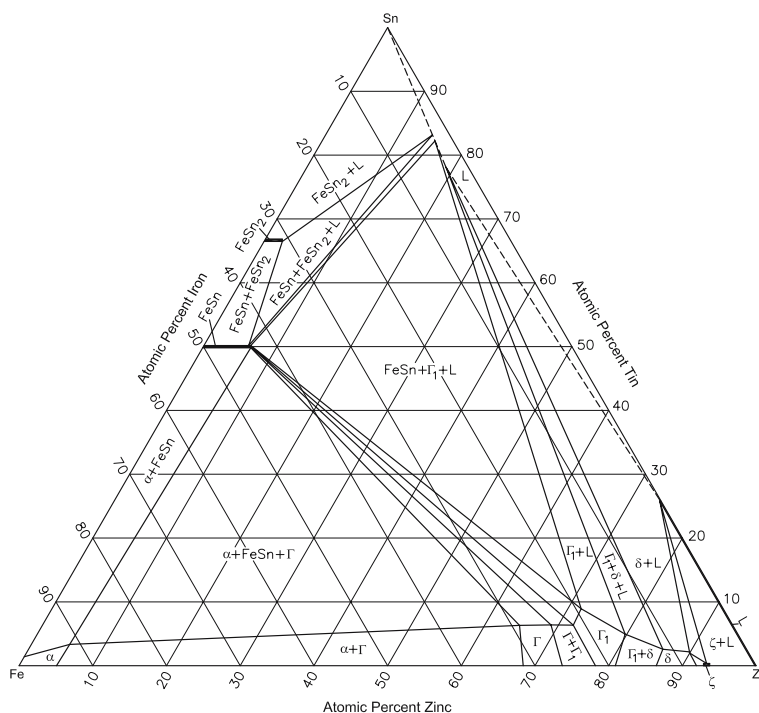


Fig. 1 Fe-Sn-Zn isothermal section at 450 °C [2003Tan]