

Co-Fe-Sb (Cobalt-Iron-Antimony)

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The previous review of this system by [1992Rag] presented a liquidus projection. Information on the ternary phase relations and the activities of Sb in the liquid phase is of interest in the recovery of Sb in nonferrous smelting processes or from ash produced in incinerators. Recently, [2004Voi] determined an isothermal section at 1150 °C for Sb-poor Fe-Co alloys.

Binary Systems

In the Co-Fe system [1984Nis], the face-centered cubic (fcc) Fe forms a continuous solid solution γ with fcc Co over a wide range of temperature. The $\gamma \rightarrow \alpha$ (body centered cubic, bcc) transformation temperature in Fe is initially raised by the addition of Co, reaching a maximum of 985 °C at 45 at.% Co. At 730 °C, the bcc phase of equiatomic composition orders to a B2 structure via a second order transition. There are several intermediate phases in the Co-Sb system [Massalski2]: CoSb (B8₁, NiAs-type hexagonal), CoSb₂ (above 377 °C, C18, FeS₂-type orthorhombic; below 377 °C, monoclinic), and CoSb₃ (D0₂, CoAs₃-type cubic). There are two intermediate phases in the Fe-Sb system: ϵ (NiAs-type hexagonal) and FeSb₂ (ortho-

rhombic). Neither of them is stable at the temperature of interest here (1150 °C).

Ternary Isothermal Section

With starting elements of 99.9+% purity, [2004Voi] melted 5 Sb-poor ternary alloys in evacuated tubes. The final anneal was at 1150 °C for 12 h, followed by water quenching. The phase equilibria were studied by metallography and electron probe microanalysis. Figure 1 shows the isothermal section at 1150 °C constructed by [2004Voi]. The Sb activities in the liquid phase, determined by [2004Voi] using an isothermal isopiestic method, are also shown in Fig. 1.

References

- 1984Nis:** T. Nishizawa and K. Ishida, The Co-Fe (Cobalt-Iron) System, *Bull. Alloy Phase Diagrams*, 1984, **5**(3), p 250-259
1992Rag: V. Raghavan, The Co-Fe-Sb (Cobalt-Iron-Antimony) System, *Phase Diagrams of Ternary Iron Alloys. Part 6*, Indian Institute of Metals, Calcutta, India, 1992, p 640-644
2004Voi: L. Voisin, M. Hino, and K. Itagaki, Phase Relations and Activities in the Fe-Co-As and Fe-Co-Sb Systems at 1150 °C, *Shigen-to-Sozai*, 2004, **120**, p131-135

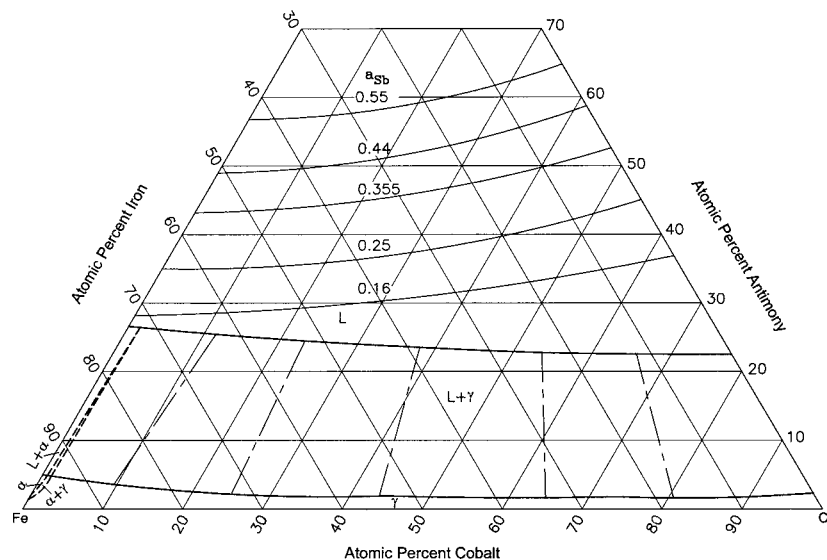


Fig. 1 Co-Fe-Sb liquid-solid equilibria and activity of Sb (a_{Sb}) at 1150 °C [2004Voi]