

As-Co-Fe (Arsenic-Cobalt-Iron)

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The previous review of this system by [1992Rag] presented an isothermal section at 597 °C. Information on the phase relations and the activities of As in this ternary system is of interest in the recovery of As in nonferrous smelting processes or from ash produced in incinerators. Recently, [2004Voi] determined an isothermal section at 1150 °C for As-poor Fe-Co alloys.

Binary Systems

The Co-As system [Massalski2] contains several intermediate phases: Co_2As , Co_3As_2 , CoAs , CoAs_2 , and CoAs_3 . The Fe-As system [Masalski2] contains three compounds: Fe_2As , FeAs , and FeAs_2 . None of these are stable at 1150 °C. 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.

Ternary Isothermal Section

With starting elements of 99.9+% purity, [2004Voi] melted 8 As-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 As 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 As-Co-Fe (Arsenic-Cobalt-Iron) System, *Phase Diagrams of Ternary Iron Alloys. Part 6*, Indian Institute of Metals, Calcutta, India, 1992, p 234-240
- 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**, p 131-135

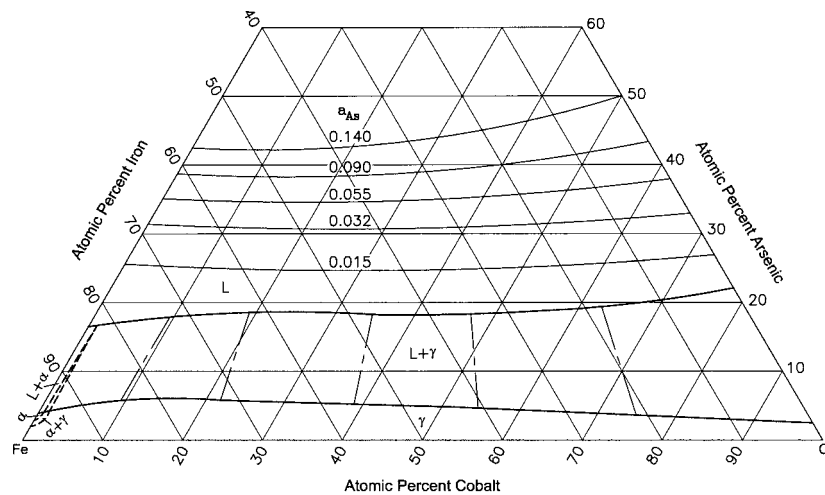


Fig. 1 As-Co-Fe liquid-solid equilibrium and activity of As (a_{As}) at 1150 °C [2004Voi]