

Al-Co-Fe (Aluminum-Cobalt-Iron)

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[88Ray] reviewed the phase relationships in this system and presented the data as: (1) two partial liquidus surfaces, one for Al-poor Fe-Co alloys and the other for compositions near the Al-corner; (2) an isothermal section at 800 °C for Co-rich alloys; (3) two isothermal sections at 640 and 600 °C for alloys near the Al-corner; and (4) a solid-state miscibility gap at ~500 °C in the bcc (α) region of the ternary Fe-rich alloys, where the order-disorder reactions occur.

Update

A recent publication of [91Koz] clarifies the phase relationships in the order-disorder region of Fe-rich alloys. The reviewed data of [88Ray] presents a closed region of the miscibility gap at 500 °C, within which the disordered bcc (α) and the B2 ordered phase coexist. The demarcation between the disordered and ordered phases outside the closed region was not indicated.

Figure 1, redrawn from the experimental results of [91Koz], shows the partial isothermal section of this ternary system at 650 °C. The tie-lines within the $\alpha(A2) + \alpha_2(B2)$ two-phase region point approximately in the direction of the Fe-AlCo line. The extent of this two-phase region decreases with increasing temperature and it disappears above ~750 °C [91Koz].

A narrow region of a miscibility gap between the two B2 phases of different compositions (denoted α_2' and α_2'' in Fig. 1) is indicated by [91Koz]; the existence of this region needs confirmation. [91Koz] also computed an isothermal section at 650 °C.

Earlier, [87Miy] reported experimental isothermal sections at 450, 500, 550, 650, and 700 °C, where the two-phase ($\alpha + \alpha_2$) region was interpreted to be a mixture of two B2 phases of different compositions with the tie-lines parallel to the Al-Co side. These results are now superseded by the conclusions of [91Koz].

Cited References

- 87Miy:** T. Miyazaki, K. Isobe, T. Kozakai, and M. Doi, "The Phase Separations of Fe-Al-Co Ordering Alloys," *Acta Metall.*, 35(2), 317-326 (1987). (Experimental; #)
- 88Ray:** G.V. Raynor and V.G. Rivlin, "Al-Co-Fe," *Phase Equilibria in Iron Ternary Alloys*, Institute of Metals, London, 71-81 (1988). (Review; #)
- 91Koz:** T. Kozakai and T. Miyazaki, "Phase Stabilities of Iron Base Ordered Structures in Fe-Al-Co Alloys," *Proc. Conf. Intermetallic Compounds—Structure and Mechanical Properties*, JIMIS-6, Japan Institute of Metals, Aoba Aramaki, Sendai, Japan, 980, 257-261 (1991). (Experimental; #)

#Indicates presence of a phase diagram.

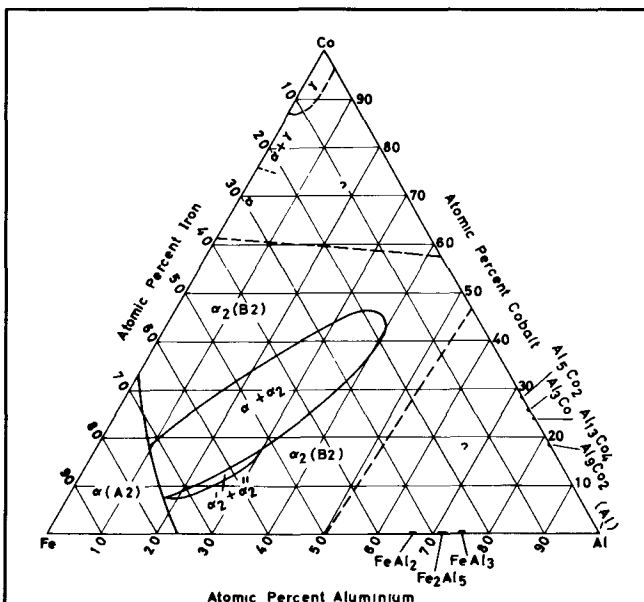


Fig. 1a Al-Co-Fe partial isothermal section at 650 °C in at.% [91Koz].

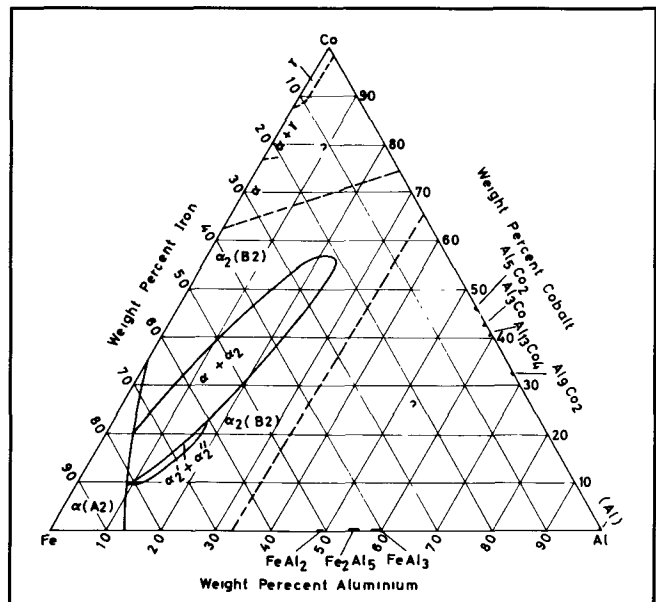


Fig. 1b Al-Co-Fe partial isothermal section at 650 °C in wt.% [91Koz].