JPEDAV (2008) 29:259
DOI: 10.1007/s11669-008-9297-9
1547-7037 ©ASM International

Al-Au-Co (Aluminum-Gold-Cobalt)

V. Raghavan

Recently, [2003Mi] determined an isothermal section of this system at 900 °C in the Al-$AuAl_2$-CoAl region. No ternary phases were found.

Binary Systems

The Al-Au system [2005Oka] depicts the following intermediate phases: $AuAl_2$ ($C1$, CaF_2-type cubic), AuAl (AuAl-type monoclinic), Au_2Al (α, β, and γ modifications with $MoSi_2$-type or related structures), Au_8Al_3 (rhombohedral, space group $R\bar{3}c$), Au_4Al (cubic, space group $P2_13$), and β (bcc). Among these, only $AuAl_2$ is relevant to the data reviewed here. The Al-rich region of the Al-Co phase diagram was reinvestigated by [1996God]. Three modifications of Co_4Al_{13}, all occurring in a narrow range of composition between 24 and 24.7 at.% Co, were found. The high-temperature Co_4Al_{13} (HT) (Os_4Al_{13}-type) is stable below 1127 °C and decomposes eutectoidally at 1083 °C to the orthorhombic form Co_4Al_{13}(o) and the monoclinic form Co_4Al_{13}(m). The other phases on the Al-rich side are: Co_2Al_9 ($D8_d$-type monoclinic), $CoAl_3$($D0_{11}$, Fe_3C-type orthorhombic), and Co_2Al_5 ($D8_{11}$-type hexagonal). On the Co-rich side, CoAl ($B2$, CsCl-type cubic) has a wide range of homogeneity from 48 to 78.5 at.% Co. There are no intermediate phases in the Au-Co system.

Ternary Isothermal Section

With starting metals of 99.999% Al, 99.999% Au, and 99.9% Co, [2003Mi] induction melted about 8 alloy compositions in the Al-$AuAl_2$-CoAl region. The alloys were annealed at 900 °C for 70 h and quenched in water. The phase equilibria were studied with x-ray powder diffraction and scanning electron microscopy. Phase compositions were measured by energy dispersive x-ray analysis or by inductively coupled plasma optical emission spectroscopy. The isothermal section constructed by [2003Mi] at 900 °C is shown in Fig. 1. The solubility of Au in Co_4Al_{13}(m) is 1.7 at.%. The solubility of Co in $AuAl_2$ is about 12 at.% at 900 °C, decreasing to10 at.% at 1000 °C. As-cast samples and samples annealed between 900 and 1000 °C revealed no ternary phases in this region.

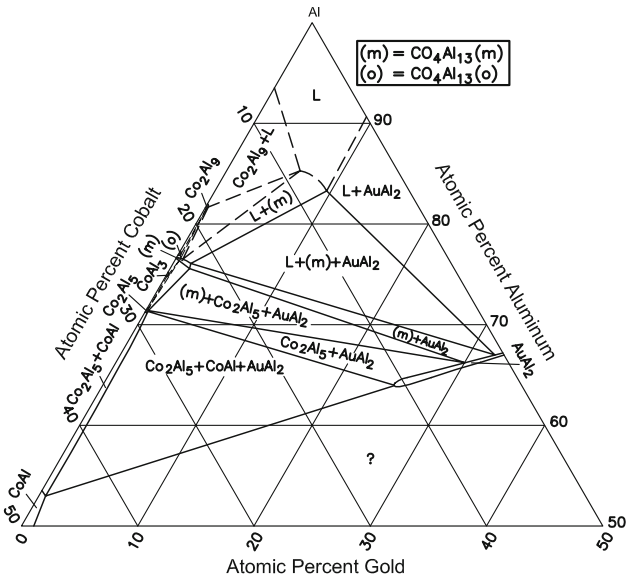

Fig. 1 Al-Au-Co isothermal section at 900 °C for the Al-$AuAl_2$-CoAl region [2003Mi]

References

1996God: T. Godecke and M. Ellner, Phase Equilibria in the Aluminum-Rich Portion of the Binary System Co-Al and in the Cobalt/Aluminum-Rich Portion of the Ternary System Co-Ni-Al, *Z. Metallkd.*, 1996, **87**(11), p 854-864

2003Mi: S. Mi, B. Grushko, C. Dong, and K. Urban, A Study of the Ternary Phase Diagrams of Al-Co with Cu, Ag and Au, *J. Alloys Compd.*, 2003, **354**, p 148-152

2005Oka: H. Okamoto, Al-Au (Aluminum-Gold), *J. Phase Equilb. Diffus.*, 2005, **26**(4), p 391-393