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

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Recently, [2006Mar] measured the shift in the Co_3AlC_x homogeneity region with the addition of Fe up to 3 at.% and the corresponding change in the Seebeck coefficient.

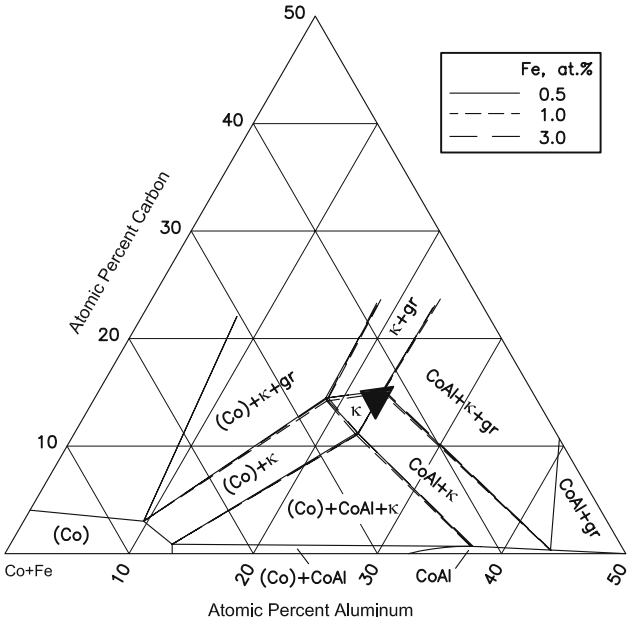

Fig. 1 Al-C-Co-Fe homogeneity range of ternary Co_3AlC_x (κ) (shaded), compared with the same in Fe-containing quaternary alloys [2006Mar]

Quaternary Phase Equilbria

An update of the Al-C-Co ternary system appears in this issue. With starting materials of high purity Co, Al_4C_3, C and Fe, [2006Mar] arc-melted under Ar atm three groups of four quaternary alloys each, containing 0.5, 1 and 3 at.% Fe respectively. All compositions were in the region of the Co_3AlC_x (κ) phase, with Fe substituting for Co. The alloys were annealed at 1200 °C for 72 h and furnace cooled. The phases were examined by x-ray diffraction, scanning electron metallography and energy dispersive x-ray analysis. In Fig. 1, the homogeneity region of the κ phase in the ternary alloys is compared with the region in the quaternary alloys. The κ region in the quaternary alloys is larger and shifted somewhat to lower Al contents. The effect of increasing Fe from 0.5 to 3 at.% on the κ region appears small.

At 600 °C, the Seebeck coefficient for $Co_3AlC_{0.67}$ is 23.3 μV per K and increases to 32.6 μV per K at $Co_{3.506}Fe_{0.025}AlC_{0.77}$.

Reference

2006Mar: T. Maruoka and R.O. Suzuki, The Phase Equilibria and Seebeck Coefficient of $(Co,M)_3AlC$ (M = Fe or Ni), *Mater. Trans.*, 2006, **47**(6), p 1422-1427