Study of phase equilibria in Al-Co and Pd-Co systems

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System Al-Pd-Co contains not only classical crystalline phases with simple unit cells, but also structurally complex phases with large unit cells, inclusive of quasicrystalline approximant ε_n. Experimental partial isothermal sections of the Al-Pd-Co phase diagram at 700°C [1] 790 [2], 850°C [3], 940, 1000 [2], 1020 [4], 1035 [5] and 1050°C [2] have been published so far. Experimental studies and thermodynamic modeling of Al-Pd binary system were done previously [6,7]. The aim of this work is to study the phase equilibria in Al-Co and Pd-Co binaries. Thermodynamic databases of Al-Co and Pd-Co were created based on literature. The calculations were performed by means of the CALPHAD method using the Thermo-Calc software. A thermodynamic description of Al-Pd-Co was created by extrapolation of binary systems. A novel thermodynamic description of U and C phase was proposed based on ternary thermodynamic model. The (Co), β-AlCo, Al_5Co_2, Al_9Co_2, $Al_{13}Co_4$ and (Al) phases belong to the Al-Co system. (Co) and (Pd) solid solutions belong to Pd-Co system. Structurally complex phases of ε-family and $Al_{13}Co_4$-family were experimentally observed. In investigation, scanning electron microscopy, energy dispersive X-ray spectroscopy, transmission electron microscopy and X-ray diffraction were used. Experimental results were then compared to calculated phase diagrams.

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