AN ALLOY WITH A LOW COEFFICIENT OF LINEAR EXPANSION

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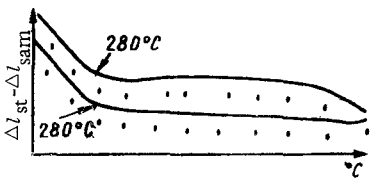

Fig. 1. Dilatometric curves of alloy with 60.61% Co, 29.85% Fe, 9.54% Cr.

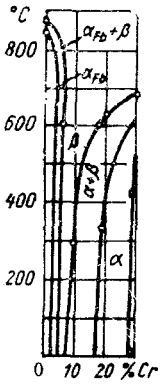

Fig. 2. Cobalt corner of vertical section of Co–Cr–Fe system at 30% Fe [2].

The results of an investigation of a cobalt–iron–chromium alloy (36.6% Fe, 8.9% Cr) with a low coefficient of thermal expansion at temperatures of 20-60°C were presented in [1].

Dilatometric analysis in the differential Chevenar dilatometer for drawing the phase equilibrium diagram of the Ce–Cr–Fe system showed [2] that after annealing the alloys at 1000°C the coefficient of linear expansion from room temperature to 1100°C is approximately 12×10^{-6} 1/deg. However, for the alloy containing 60.61% Co, 29.85% Fe, and 9.54% Cr one finds an anomaly in the dilatometric curve (Fig. 1) at temperatures below 280°C associated with a low coefficient of linear expansion coefficient of quartz ($\sim 0.5 \times 10^{-6}$ 1/deg). Above 300°C the expansion coefficient of the alloy increases sharply to $\sim 12 \times 10^{-6}$ 1/deg. The microstructure of this alloy at room temperature consists of fcc β-phase and hcp α-phase. It can be seen in Fig. 2 that at 280°C the alloy with 30% Fe [2] undergoes the $\alpha + \beta \rightarrow \beta$ transformation. The alloy with the same iron concentration but 19.5% Cr, in which the $\alpha \rightarrow \alpha + \beta \rightarrow \beta$ transformation occurs at 330-625°C, has no such anomaly.

LITERATURE CITED

1. L. Davies, J. Iron Steel Inst., 29, No. 9 (1956).
2. V. N. Svechnikov and A. Ts. Spektor, Collection of Scientific Reports of the Metal Physics Institute of the Academy of Sciences UkrSSR, Problems of Physics of Metals and Metal Science [in Russian], No. 10 (1959).

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