THERMAL DIFFUSIVITY OF THE NI-V SYSTEM WITH VANADIUM CONTENT UP TO 22 at.% AT HIGH TEMPERATURES

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This study is a continuation of the work [1], in which it was noted that when dissolving from 8 to 17 at.% vanadium in pure nickel, the thermal diffusivity polytherms undergo a small jump, blurred in the temperature range 1050–1170 K. In the phase diagram, this range of temperatures and concentrations corresponds to the region of the solid solution that on the right borders the region of the two-phase state (Ni)+Ni_3V, and below 680 K — with the ordering region Ni_8V. The studies performed in [2] on samples with a content of 16–19 at.% V showed that when quenched from high temperatures, a modulated structure is formed in them, which upon subsequent annealing below 1080 K leads to the formation of two-phase state (Ni)+Ni_3V.

In this paper we report the results of measurements of the temperature dependences of the thermal diffusivity, the resistivity, and the thermoelectric power of Ni-V alloys with a vanadium content of 7 to 22 at.% at high temperatures in the thermal cycling regime with an average heating-cooling rate of 0.06 K/c.

It is established that in the temperature range from 1050 to 1170 K the phonon component of thermal conductivity (in contrast to the electronic component) undergoes a jump, the magnitude of which increases with increasing vanadium concentration in alloys. In this case, the polytherms of the resistivity undergo a break near ∼900 K, and the angle of the kink decreases with increasing vanadium concentration. Proceeding from this, it is assumed that the observed anomalies of the polytherm of thermal diffusivity of Ni-V alloys with a vanadium concentration lower than 16 at.% are associated with the formation of modulated structures of the dissolved component in these alloys.

1. Polev V.F., Startseva M.I., Gorbatov V.I., Glagoleva Yu.V., Korshunov I.G. // The Physics of Metals and Metallography. 2012. V. 113. No. 1. P. 39.
2. Moreen H.A., Taggart R., Polonis D.H. // Metallurgical Transactions. 1974. V. 5. P. 79