

1.1.37. EFFECT OF STRUCTURE OF NICKEL ALLOYS ON THEIR MAGNETIC PERMEABILITY VALUE

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Invar N30K10T3 (mass. %: 0,01C; 30,0 Ni; 10,0 Co; 3,2 Ti; the rest Fe) after quenching from 1150°C in water has a ferromagnetic structure. Austenite (γ -phase) of the alloy has Curier temperature $T_c = 200^\circ\text{C}$ and temperature of start of martensitic transformation $M_s \approx -80^\circ\text{C}$. At these γ -phase present supersaturated solution capable to decomposition at heating. Quenched alloy heating in the interval of temperatures from 550 till 700°C bring about the distinguishing oneself in austenite grains – intermetallic compound particles Ni_3Ti . Austenite loses some nickel and titanium and as result there are occurs increasing of the temperature of start of martensitic transformation higher then room one. Therefore in aged invar at cooling from $T_a \geq 650^\circ\text{C}$ till room one there is take place martensitic $\gamma \rightarrow \alpha$ transformation. Durability of aged invar depends from dispersed intermetallic compound particles presence and α -phase as well. Alloy hardness increase monotonically with rising ageing temperatures. Quenching and ageing of the alloy cooled in liquid nitrogen evokes in it martensitic $\gamma \rightarrow \alpha$ transformation and strengthens it additionally.

Plastic deformation also promotes an alloy durability, because of many dislocations appear in austenite grains, which forms a strip type of structure. Alloy deformation intensifies process of decomposition of solid solution and disintegrated particles increase dislocations fastening. At that a hardness of alloy grows monotonically as ageing temperature raises.

As to magnetic permeability of a quenched and deformed austenite it monotonically decrease as ageing temperature increase. At that definite correlation observes between alloy hardness and it's magnetic permeability: magnetic permeability of the alloy decrease as it's hardness increase. The cause is that a martensitic sructure appears in γ -phase.

By means of experimental it has been established that magnetic permeability measuring result in capability of definition of main stages of transformation that take place in the invar alloys.

Reference:

1. **Dyakin V.V., Sandovskii V.A.** The problems of electrodynamics in nondestructive testing. – Ekaterinburg. – Ural Division of Russian Academy of Sciences. – 2007. – 388 with.