Nanocomposites and nanomaterials
The effect of thermomechanical treatment with nanoparticles formation on inelastic behavior of Fe-Ni-Co-Ti alloys

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New multifunctional materials are widely represented at the market of modern technologies in materials science. Among them, shape memory alloys (SPA), changing their shape under the influence of temperature, mechanical or magnetic fields, or their simultaneous action, occupy a special place. It should be noted that along with traditional copper-based alloys and nitinol (NiTi), iron-based alloys, such as Fe-Mn, Fe-Pd, Fe-Pt, Fe-Ni-Co-Ti, are of increasing interest.

As a result of the decomposition of solid solutions, composites consisting of nanoparticles located in the matrix are formed. The properties of such composites are largely determined by the interaction of nanoparticles with the matrix. Forming a system of nanoparticles located in a ferromagnetic SMA matrix, it is possible to control the thermoelastic martensitic transformation (MT), shape memory effects (SME) and superelasticity (SE), which occur in Fe-Ni-Co-Ti alloys [1].

An alloy of the composition Fe-27.2% Ni-17.4% Co-5.2% Ti (mass%) was investigated. To strengthen the matrix and complex control of the induced MT, a thermomechanical treatment (TMT) of the alloy is proposed, which includes quenching, drawing with different compression ratios, followed by annealing. The mechanical properties of the alloy with a change in temperature under the application of various mechanical and magnetic fields were studied. An increase in SE deformation and SME as a function of TMT was observed. It has been established that the TMT consisting of quenching, drawing with compression ratios =7.4÷22.5% and aging at 650°C for 5-10 min corresponds to the optimal combination of SE and SME in the investigated alloy.

1. *Titenko A.N. , Demchenko L.D.* Superelastic Deformation in Polycrystalline Fe-Ni-Co-Ti-Cu Alloys // J Mater Eng Perform. - 2012. - **21**, N 12. -P. 2525-2529.