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# Effect of external influences on the strength and plasticity of metals and alloys

## Book of the International Workshop Articles

**Barnaul-Belokurikha**

**15-20 September 2015**

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**Reviewers**

Professor, Sc. D. (Phys.-math.) Starostenkov M.D.
Professor, Sc. D. (Phys.-math.) Dmitriev S.V.
Professor, Sc. D. (Phys.-math.) Gromov V.E.
Professor, Sc. D. (Engineering) Guriev A.M.

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The repots made at the Russian-Chinese International seminar are brought in this edition. The problems of the external energy fields action on the structure, phase composition, defect substructure of different metals and alloys during deformation are discussed.

The book of articles is intended for the material science and metallurgy specialists and can be usefully for the post graduate student of corresponding specialist.

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doesn't cause any changes of intensity of thermohighlighting. Therefore, in low-temperature area there is a destruction of the hole centers of coloring in the main crystal of corundum and under the influence of strong electric field (about $10^6$ V/m) quasifree holes are involved in area with the raised maintenance of the electronic centers $Cr^{2+}$. As a result recombinational process of emission of a photon in the field of R-lines of a luminescence of crystals of a ruby proceeds [2].


**References**

[1] Denks E. Proceedings of the Institute of Physics and AS ESSR. 26. 1964. P. 102-107.

[2] Markin V.B. Experimental methods for studying physical processes. Barnaul: AltSTU, 2012. 177 p.


## TRIBOTECHNICAL PROPERTIES OF MATERIALS WITH SHAPE MEMORY AT HIGH LOADINGS


Galsanov **S.V.**, **Potekaev A.I.**

*National research Tomsk state University, Russia, s_galsanov@mail.ru*


Firmly established [1,2] that nickelide titanium exhibits improved wear resistance approaching speed to the materials. In this paper the results of experimental studies of wear, the wear resistance and friction coefficient of Nickel-titanium alloys.

Used samples in the form of cylinders with a diameter of 9 mm and a height of 10 mm of the following structures, different content and characteristic temperatures at the beginning of martensitic transformation of M„ were used: TijoNi47,;$Fe_2$,s (TH-1K), $T4_M Ni_S$o,«, TU^Ni^i, Ti^Ni^a. Research was conducted by machine of friction of SMT-1 and a three-dimensional profilograph - profilometer «Still».

Studies have shown that Nickel-titanium is characterized by low compared with other materials time and running quite fast exit mode steady-state wear. Analysis of intensity of wear (*/*) pressure *(q)* for different velocities (v) showed the following: in all cases, the observed increase in / with increasing v and *q;* large values of sliding velocities and pressures lead to instability of friction at an early stage of wear (15-20 min) and catastrophic wear; the greatest influence on the wear has a sliding speed.

The temperature in the contact zone has great influence on the nature of the wear and wear resistance. At large values of v and *q* the temperature is increased from the original almost three times. This growth is sufficient to change the structural-phase state, properties of surface layers and change the wear mechanisms.

The decrease in friction coefficient with increasing v and *q* is explained by the increasing strength of the surface layers, as well as small changes in the adhesion and deformation components of the friction forces and the reduction of the shear resistance of the material on the surfaces of friction with increasing compressive loads.

The results of the study of the tribological properties allowed on the basis of the analysis of the dependencies of wear and intensities wear to distinguish three zones /, depending on v and *q*. The first area with light modes at v«.1,0-1,2 m/s and #-5,1-5,2 MPa, there is a very large time plot of the steady-state wear. These values of v and *q* based work most of the elements and nodes with friction. The second zone with average modes of sliding velocities and pressures: v= 1,2-1,4 m/s and #-5,3-5,8 MPa. In the first half of these intervals the time of the steady-state wear is large enough, although shorter, is a similar section of the first zone. The third zone is characterized by the values v>1,4 m / s and < ? > 5 , 8 MPa, at which the plot of the steady-state wear small or missing altogether. The host in this case, short-term, accompanied by vibration and noise.

The destruction of the surface layers and the separation of particles occurs in a variety of speed-power zones on different mechanisms. In the first and partly the second areas where the wear products have the form of small scales, the wear is on the mechanism of fatigue fracture. In this case, a force on the surface layers is accompanied by cyclic change of compressive and tensile stresses in microblasted contact, resulting in achievement of a fatigue limit, and, consequently, to the destruction of microvolumes.

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