RESULTS OF THE ALL-UNION COMPETITION OF THE SCIENTIFIC-
TECHNICAL SOCIETY OF THE MACHINE INDUSTRY FOR THE 1962
D. K. CHERNOV AND N. A. MINKEVICH PRIZES

A. F. Golovin and A. N. Minkevich

Translated from Metallovedenie i Termicheskaya Obrabotka Metallov, No. 4,
pp. 63-65, April, 1963

The first D. K. Chernov prize was awarded to Yu. A. Bagaryatskii, G. I. Nosova, and T. V. Tyagunova for their
work on x-ray analysis of phase transformations in titanium alloys and an investigation of the atomic aging mecha-
nism of metal alloys.

The main results were published in the following articles:

quenching—a special kind of martensitic transformation," FMM, 1962, No. 3.


3. G. I. Nosova, X-ray Investigation of Phase Transformations in Titanium Alloys [in Russian], Candidate's dis-
sertation, Moscow Steel Institute, 1962.

ence and the Physics of Metals, No. 7 [in Russian], Metallurgizdat, 1962.

These investigations are important contributions to the study of metals and are well known in the USSR and
abroad. The first three investigations present solutions of the complex problem of phase transformations in titanium
alloys. The authors put in evidence the previously unknown α* and ω phases, which have a considerable effect on
the mechanical properties of the alloys. The mechanism and structure of these phases were investigated.

The results of these investigations explain martensitic transformations more fully. The important theoretical
conclusion is that the ω-phase formed during quenching from the β-region is a martensitic phase of a special kind.
New metastable phases and the conditions of their formation were also discovered. This important practical knowl-
edge will make it possible to choose heat treatment conditions for titanium alloys which will eliminate embrittle-
ment due to formation of the ω-phase.

The fourth article deals with the successive stages of the decomposition of supersaturated solid solutions in
alloys. Three stages were demonstrated experimentally: redistribution of the atoms of the dissolved element in
the crystals of the solid solution, the reconstruction of the crystal lattice into the lattice of the precipitated phase in
submicroscopic regions of the crystals (formation of a new structure), the relief of phase cold hardening and the im-
provement of the regularity of the crystal structure of the precipitated phase. It was shown that the first stage is trans-
formed into the second by the martensitic mechanism in regions with the proper composition.

On the basis of the results obtained with titanium alloys it was suggested that eutectic decomposition (at rather
low temperatures) proceeds through these three stages.

The second D. K. Chernov prize was awarded to the following people:

1. L. M. Utevskii for his monograph, Brittleness of Steel Induced by Tempering, Metallurgizdat, 1961.

The monograph is divided into three parts. In the first part the author describes the main experimental and
technological data on the phenomenon of reversible brittleness induced by tempering.

The second part concerns the results of experimental investigations of the processes responsible for the develop-
ment of this type of defect.
In the third part the author gives theoretical and experimental data concerning the reversible brittleness induced by tempering of alloyed structural steels. To a certain extent these data reconcile the carbide theory of brittleness induced by tempering and the phosphorus theory.

The author used an original experimental method of investigating the structure, phase composition, and chemical composition of the grain boundaries. The monograph is a result of several years of work on the brittleness of steel induced by tempering and is an important contribution to the study of metals.


The book is a text on high-temperature tests of the mechanical properties of metals. It contains recommendations on the choice of apparatus, their use, the technique of testing, and the interpretation of the results.

The book includes the latest scientific-technical information on mechanical tests of metals at high temperatures. It is intended for technological engineers, scientific workers in metallurgy and machine construction plants, scientific-research institute personnel, and also university and engineering students.

3. M. G. Lozinskii and N. Z. Pertsovskii for their investigation of the mechanism of the plastic deformation of metals at high temperatures at different strain rates.

The main results of these investigations were published in five articles:


"Kinetics and mechanism of deformation of metals at high temperatures and at different strain rates," Izv. AN SSSR, OTN, seriya Metallurgiya i toplivo, 1961, No. 1.

"Main types of deformational microtopography occurring at high temperatures in polycrystalline metals with face-centered cubic lattices," Izv. AN SSSR, OTN, seriya Metallurgiya i toplivo, 1962, No. 1.

"Investigation of the microstructure of deformed palladium during elongation at high temperatures," Izv. AN SSSR, OTN, seriya Metallurgiya i toplivo, 1962, No. 2.

"Peculiarities of the deformation of nickel at different temperatures and strain rates," Izv. AN SSSR, OTN, seriya Metallurgiya i toplivo, 1962, No. 4.

The first two articles describe a vacuum apparatus for the study of the microstructure of metal under stress at high temperatures and a method of investigating the plastic deformation of metals with this apparatus. In the third article the authors classify the different types of deformational topography resulting from plastic deformation at high temperatures. The fourth and fifth articles describe an investigation of the microstructure of palladium and nickel deformed at different temperatures and strain rates.

These investigations contain new data and should be useful to scientific and engineering personnel concerned with plastic deformation at high temperatures.

4. V. T. Borisov, V. M. Golikov, and G. V. Sherbeinskii for their investigation of the kinetics and mechanism of diffusion at the grain boundaries and within grains of metals.

These investigations were described in the following articles:


To determine the peculiarities of diffusion processes in polycrystalline metals the authors worked out methods of measuring the volume diffusion and boundary diffusion separately. They obtained valuable information on the effect of surface-active elements on the mobility of atoms in the grains and along the grain boundaries. The results of the investigation and the analysis of the relationship between the diffusion parameters and the characteristics of the grain boundaries will be of great interest to metallurgists. The data can be used to explain processes related to the mobility of atoms. It was shown experimentally that boron and molybdenum decrease the mobility of iron atoms along the grain boundaries and decrease their surface energy. The investigation of the effect of the structure on the