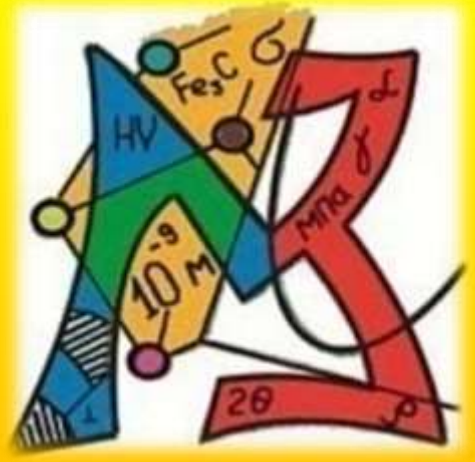


Department of Materials Science NTU "KPI"

"Materials Science" of department

Professor, Doctor of physical and mathematical sciences, head of the Department of Materials Science **Sobol' O.V.**
147 articles (in scientometric bases of Scopus), *h*-index: 17
Scopus Author ID: 6602346708
http://orcid.org/0000-0002-4497-4419
e-mail: sool@kpi.kharkov.ua

Specialization of the Bachelors and Masters:

- 132-01 „Applied Materials Science and Computer Engineering of Materials"
- 132-02 „New functional materials and nanotechnology "

Technologies and equipment for teaching and research available at the department :

- difractometers for precise structural studies and tensometry (DRON-4, DRON-3M, DRON-2)
- transmission electron microscopy (TEM)
- microscopes for high-resolution optical analysis and software packages for image processing
- vacuum arc evaporation (both in standard mode and with pulsed stimulation with voltage up to 2 kV and a pulse duration of 20 μs);
- magnetron sputtering;
- microarc oxidation (MAO);
- processing high-frequency currents;
- different kinds of thermochemical treatment (boriding, nitriding)
- ion nitriding with pulse stimulation and subsequent application of protective coatings

Staff of the department "Materials Science"

1. Prof. Sobol O.V.
2. Prof. Belozerov V.V.
3. Prof. Pogrebnoy N.A.
4. Prof. Andreev A.A.
5. Prof. Beresnev V.M.
6. Assoc. Prof. Zubkov A.I.
7. Assoc. Prof. Kolupaev I.N.
8. Assoc. Prof. Protasenko T.A.
9. Assoc. Prof. Subbotin V.V.
10. Assoc. Prof. Rebrov E.M.
11. Assoc. Prof. Terletskii A.S.
12. Assoc. Prof. Barmin A.E.
13. Assoc. Prof. Volkov O.A.
14. Assoc. Prof. Menshikov A.G.
15. Star. Lecturer Shevchenko S.M.

Also 9 research workers and 4 graduate students

Specializations

132-01 " Applied materials science and computer engineering of materials"

Basic special educational disciplines: 1. Metallurgy, 2. Automation of production processes and equipment, 3. Theory and technology of thermal processing, 4. Mechanical properties and structural strength of materials, 5. Examination of the structure and physical-mechanical properties of metallic materials, 6. Computer engineering of materials; 7. Structural engineering of surfaces and nanomaterials; 8. Vacuum plasma technology in materials; 9. Computer materials science.

Brief description of specialization. Program specialization "Applied materials science and computer engineering of materials" is carried out on the basic Department of Materials science includes:

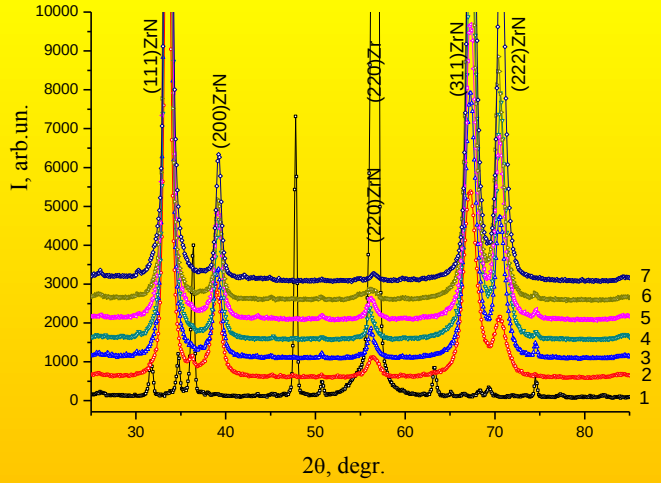
- Thorough theoretical and practical training in fundamental sciences and humanities and specialized knowledge of modern level in matters of structure engineering and properties of metals, alloys, compositions and functional coatings;
- The use of modern computer technology to analyze the structure, simulate impacts and automation of industrial processes;
- Gaining knowledge of theoretical and practical experience in technology development of thermal, chemical and thermal processing techniques and alternative materials;
- Studying the structures and properties of ferrous, nonferrous and precious metals and alloys, materials science knowledge of jewelry and decorative art and industry;
- The study of modern nano materials science which is the base for new technologies;
- Gaining knowledge and practical skills in computer modeling techniques, design and prediction of all processes that occur within a variety of stages of the creation of new materials;
- Mathematical modeling using modern computer technology and computer equipment;
- Mastering a foreign language for professional communication.

132-02 "New functional materials and nanotechnology"

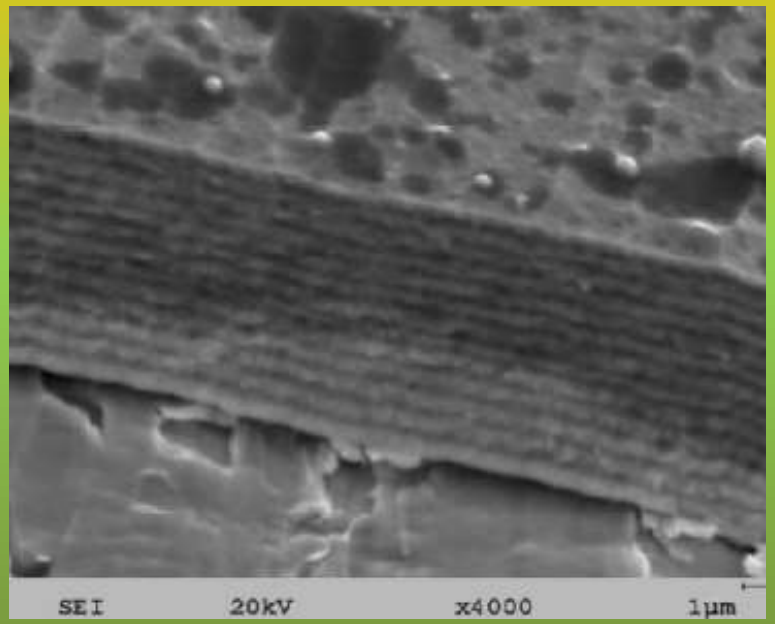
Basic special educational disciplines: 1. Structure and methods of materials research ; 2. Fundamentals of nanotechnology; 3. Corrosion and protection of materials; 4. The basic technology of new functional materials and nanotechnology; 5 Coatings properties and technology; 6. Methods of materials electron microscopic analysis; 7. Disperse and composite materials; 8. Information support of computer research in materials science.

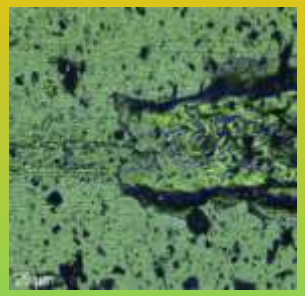
Brief description of specialization. Program specialization "New functional materials and nanotechnology", which is carried out on the basic Department of Materials science includes:

- mastering basic knowledge of fundamental science, general training and specialized knowledge of the modern level in terms of engineering structures and properties of metals alloys, compositions and functional coatings for macro-, micro- and nanolevels and the creation of these products for the needs of engineering, aviation and space industry, electrical engineering, nanotechnology and other fields of science and technology;
- The use of modern computer technology to design new materials, basic theoretical knowledge and practical skills in structural engineering, which is the basis in obtaining the necessary functional properties;
- Theoretical foundations and practical skills of the latest achievements thermal, chemical and thermal, thermomechanical and high-frequency technology, the impact of high-density and high-energy flows, nanotechnology, including the structural design of nanomaterials;
- The practical use of software on computer modeling of processes at different stages of materials construction: structural materials, for instrumental, jewelry and special purpose, composite materials, the characteristics of connections and processes formations;
- Training of new materials marketing and energy efficient environmental technologies
- the mastery of a foreign language for practical use in professional activities.

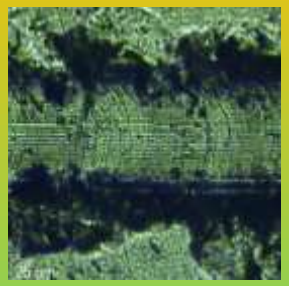


Research the multilayer compositions of single- and multicomponent nitrides of transition metals (including high-entropy alloys (TiAlHfVNb)N, (TiAlHfVNb)N, (TiAlHfVNbtTa)N, (FeCoNiNbCrCuV)N), (TiAlCrSiNb)N, with high and ultrahigh hardness. Structural Engineering of steels surfaces (including the formation of S-phase, etc.) by means of ion nitriding, followed by coating nitride or metal coatings.

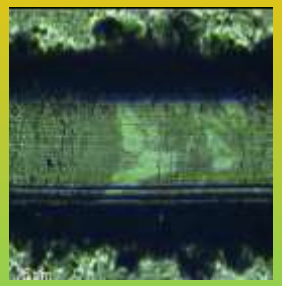




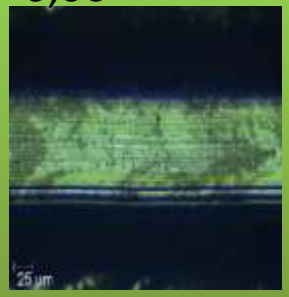
L_{c1} = 6,06



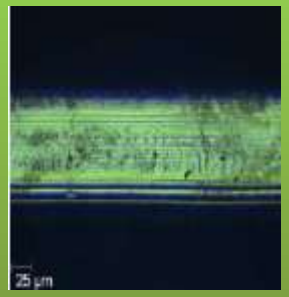
L_{c2} = 31.3



L_{c3} = 45.5

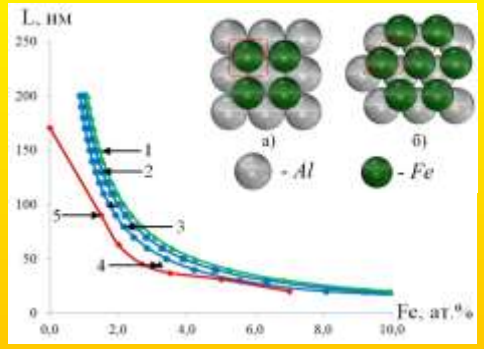


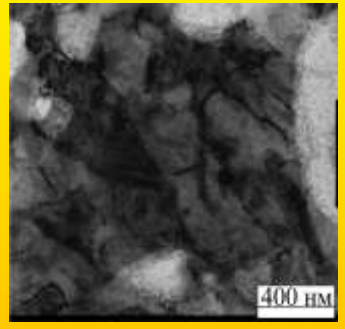
L_{c4} = 81.6

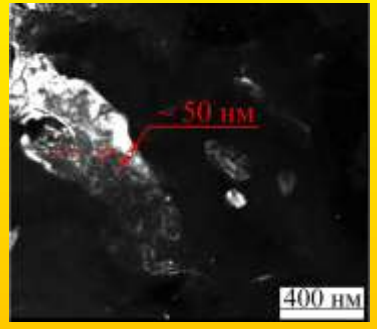


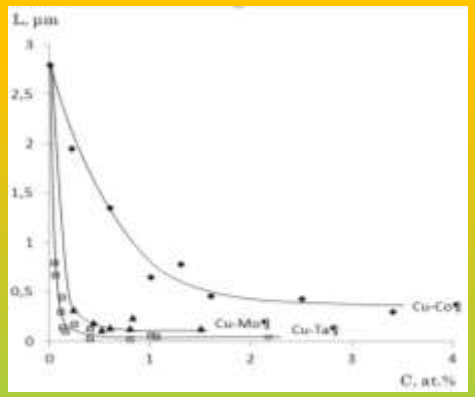
L_{c5} = 124.9

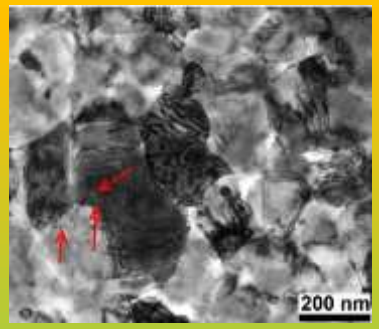
Development of producing technology and studying the structure and properties of nanostructured metals based on copper, iron and aluminum

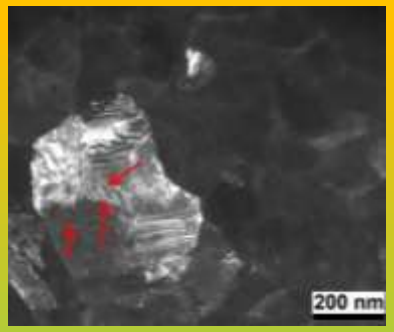


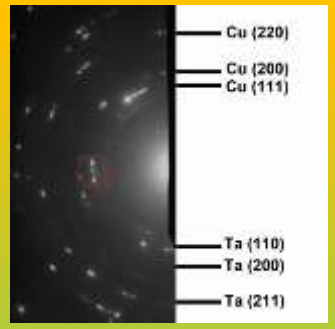




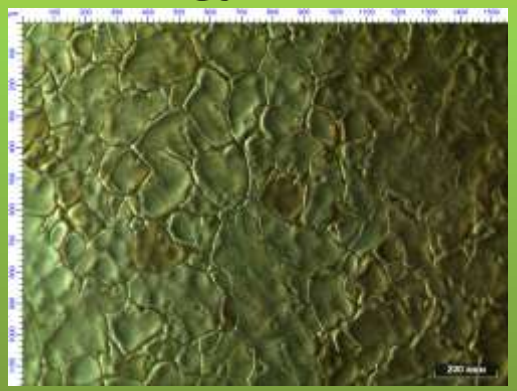


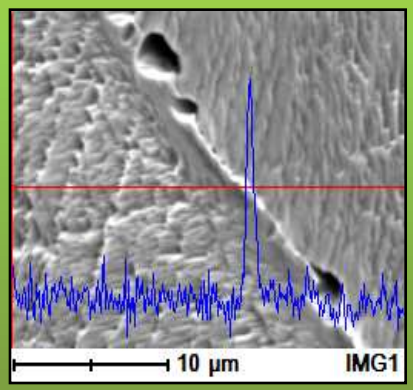




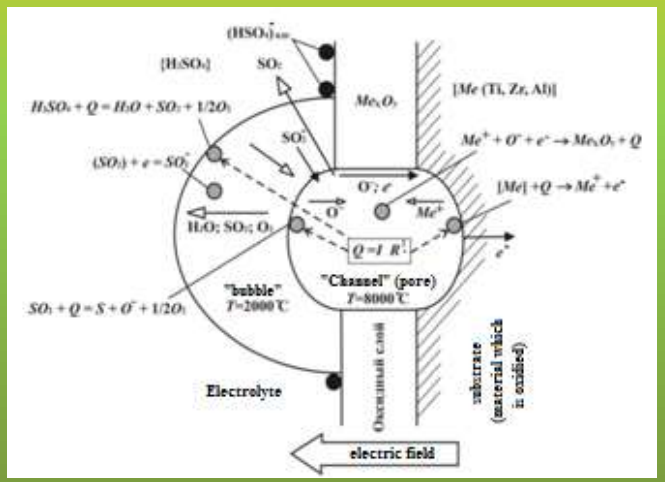


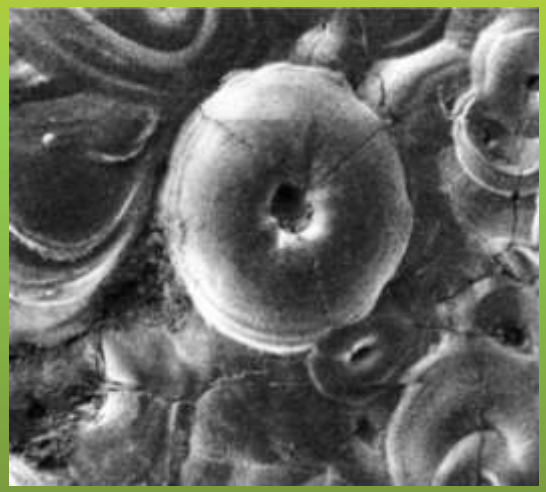
Vacuum metallurgy

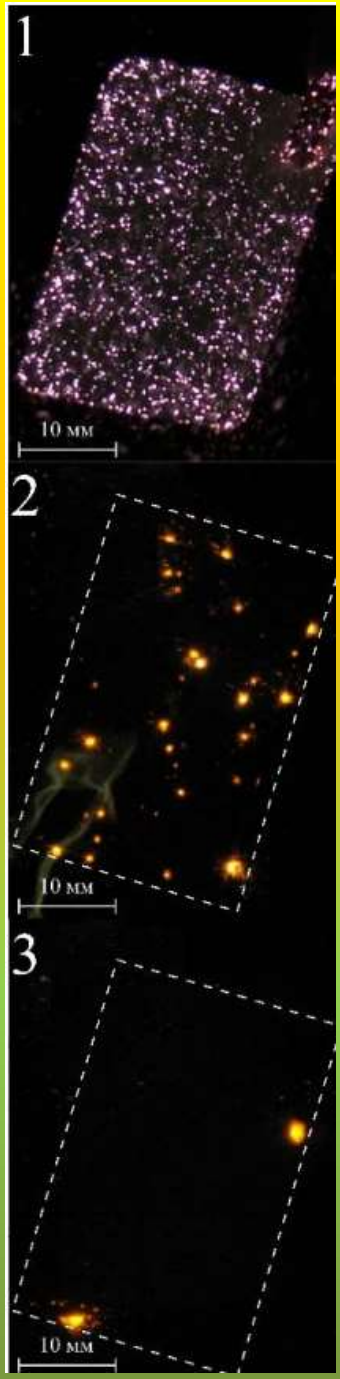




Obtaining and investigation of MAO coatings to improve the effectiveness and expand the range of processed alloy. Approbation of new electrolytes, selection of optimum modes, new power supply

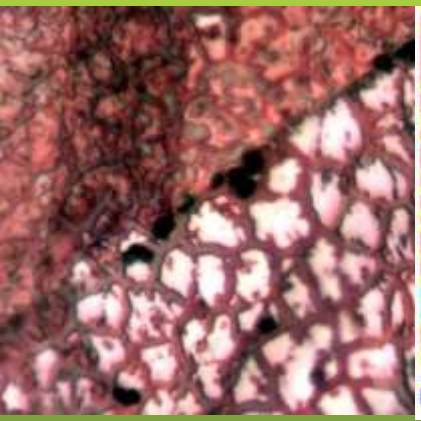


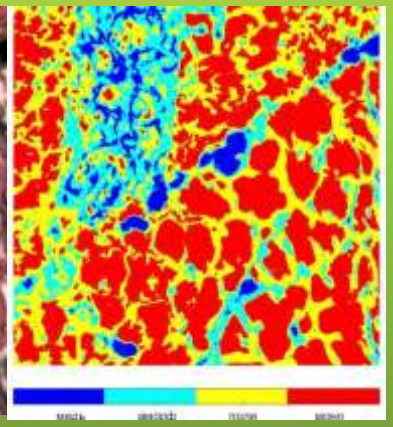




Progressive methods of heat treatment machinery parts and semi-finished products

Strength and plasticity of alloys with duplex structure





Application the computer processing of optical images of the surface in the case of multi threshold intensity sections

Scopus for publication in 2016

1. Sobol O.V. Structure and mechanical properties of nitride multilayer systems on the basis of high entropy alloys and transition metals of group VI / U.S. Nyemchenko, V.M. Beresnev, O.V. Sobol, S.V. Lytovchenko, V.A. Stolbovoy, V.Ju. Novikov, A.A. Meylekhov, A.A. Postelnyk, M.G. Kovaleva // PAST. – 2016. – Vol. 101. – Is. 1. – P. 112–120
2. O.V. Sobol. Effect of High-Entropy Components of Nitride Layers on Nitrogen Content and Hardness of (TiN-Cu)/(AlNbTiMoVCr)N Vacuum-Arc Multilayer Coatings / V.M. Beresnev, O.V. Sobol, S.V. Lytovchenko, U.S. Nyemchenko, V.A. Stolbovoy, D.A. Kolesnikov, A.A. Meylehov, A.A. Postelnyk, P.V. Turbin, L.V. Malikov // Journal of Nano-and Electronic Physics. – 2016. – Is. 2. – P. 02057-1
3. O.V.Sobol. Influence of Annealing on the Morphology of the Vacuum – free Coatings NbNx, NbNx : Si /V.N.Rogoz, A.P.Kuzmenko, O.V.Sobol, A.Plyushchyk// Journal of Nano-and Electronic Physics. – 2016. –Vol. 8. - Is. 2. – P. 02019-1
4. O. V. Sobol'. Nb–Al–N thin films: Structural transition from nanocrystalline solid solution nc-(Nb,Al)N into nanocomposite nc-(Nb, Al)N/a–AlN / V. I. Ivashchenko, S. N. Dub, P. L. Scrynskii, A. D. Pogrebnjak, O. V. Sobol', G. N. Tolmacheva, V. M. Rogoz, A. K. Sinel'chenko // Journal of Superhard Materials. – 2016. – Vol. 38. – Is. 2. – 103 – 113.
5. O. V. Sobol'. Effect of the deposition parameters on the phase–structure state, hardness, and tribological characteristics of Mo_2N/CrN vacuum–arc multilayer coatings /V. M. Beresnev, S. A. Klimenko, O. V. Sobol', S. S. Grankin, V. A. Stolbovoi, P. V. Turbin, V. Yu. Novikov, A. A. Meilekhov, S. V. Litovchenko, L. V. Malikova // Journal of Superhard Materials. – 2016. - Vol. 38. – Is. 2. – 114 – 122.
6. O. V. Sobol'. Structure Engineering in Vacuum-Arc-Deposited Coatings of the MoN–CrN System / V. M. Beresneva, O. V. Sobol', A. D. Pogrebnjak, S. S. Grankin, V. A. Stolbovoi, P. V. Turbin, e, A. A. Meilekhov , and M. Yu. Arseenko // Technical Physics Letters. – 2016. - Vol. 42. - Is. 5. - 532–535.
7. O.V. Sobol'. Structural Engineering Vacuum-plasma Coatings Interstitial Phases // Journal of Nano-and Electronic Physics. – 2016. –Vol. 8. - Is. 2. – P. 02024-1
8. O. V. Sobol'. Structural Engineering of Vacuum-ARC Multiperiod Coatings//O. V. Sobol', A. A. Andreev, V. F. Gorban' // Metal Science and Heat Treatment. – 2016. – Vol. 58. - Is.2. - 37–39.
9. O. V. Sobol'. Recrystallization and formation of spheroidal gold particles in amorphous-like AlN–TiB_2–$TiSi_2$coatings after annealing and subsequent implantation / A. D. Pogrebnjak, A. A. Dem'yanenko, V. M. Beresnev, O. V. Sobol', O. M. Ivasishin, K. Oyoshi, Y. Takeda, H. Amekura, A. I. Kupchishin // Physics of the Solid State. – 2016. – Vol. 58. - Is.2. - 1453–1457
10. O.V. Sobol'. The influence of nitrogen pressure on the structure of condensates, obtained at vacuum-arc deposition from high entropy alloy AlCrTiZrNbY/ V.M. Beresnev, O.V. Sobol', U.S. Nyemchenko, S.V. Lytovchenko, G.F. Gorban', V.A. Stolbovoy, D.A. Kolesnikov, A.A. Meylekhov, A.A. Postelnyk, V.Yu. Novikov// PAST. - 2016. Is. 2(102), p.86-91

11. O. V. Sobol'. Possibilities of structural engineering in multilayer vacuum-arc ZrN/CrN coatings by varying the nanolayer thickness and application of a bias potential / O. V. Sobol', A. A. Andreev, V. F. Gorban', V. A. Stolbovoy, A. A. Melekhov, A. A. Postelnyk / Technical Physics. – 2016. – Vol. 61. - Is. 7. - 1060–1063
12. Sobol O.V. Influence of pressure of working atmosphere on the formation of phase-structural state and physical and mechanical properties of vacuum-arc multilayer coatings ZrN/CrN / O.V. Sobol', A.A. Andreev, V.F. Gorban, V.A. Stolbovoy, A.A. Meylekhov, A.A. Postelnyk , A.V. Dolomanov // PAST. – 2016. – Vol. 101. – Is. 1. – P. 134–139.
13. Sobol' O.V. Influence of high-voltage constant potential bias on structure and properties of MoN/CrN multilayer composite with different layer thickness / S.S. Grankin , V.M. Beresnev, O.V. Sobol', S.V. Lytovchenko, V.A. Stolbovoy, D.A. Kolesnikov, A.A. Meylekhov, A.A. Postelnyk, I.N. Toryanik // PAST. – 2016. – Vol. 101. – Is. 1. – P. 154–159.
14. Sobol O.V. Structural engineering of the vacuum arc ZrN/CrN multilayer coatings / O.V. Sobol, A.A. Andreev, V.F. Gorban, A.A. Meylekhov, A.A. Postelnyk, V.A. Stolbovoy // Journal of Nano-and Electronic Physics. – 2016. – Vol. 8. – Is. 1. – P. 1042-1
15. Sobol O.V. Influence on mechanical characteristics of thickness of layers in MoN/CrN multilayer coatings, deposited under the influence of negative bias potential/ V.M. Beresnev, O.V. Sobol, A.V. Stolbovoy, S.V. Lytovchenko, D.A. Kolesnikov, U.S. Nyemchenko, A.A. Meylehov, A.A. Postelnyk // Journal of Nano-and Electronic Physics. – 2016. – Vol. 8. – Is. 1. – P. 1043-1
16. Sobol O.V. Study of the ion nitriding regimes on the structure and hardness of stell/ O.V. Sobol, A.A. Andreev, V.A. Stolbovoy, S.A. Knyazev, A.E. Barmin, N.A. Krivobok // Eastern-European journal of enterprise technologies. – 2016. – Vol. 2. - Is. 5(80), - 3, 63-68.
17. O. V. Sobol. Physical and mechanical properties of (Ti–Zr–Nb)N coatings fabricated by vacuum-arc deposition / V. M. Beresnev, O. V. Sobol, S. S. Grankin, U. S. Nemchenko, V. Yu. Novikov, O. V. Bondar, K. O. Belovol, O. V. Maksakova, D. K. Eskermesov // Inorganic Materials: Applied Research. – 2016. – Vol. 7, Is. 3, 388–394.
18. Sobol O.V. Structural and mechanical properties of NbN and Nb-Si-N films: experiment and molecular dynamics simulations / A. D. Pogrebniak, O. V. Bondar, G. Abadias, V. Ivashchenko, O. V. Sobol, S. Jurga, E. Cov // Ceramics International. – 2016. – Is. 19. – № 4. – 11743–11756.
19. O. V. Sobol'. The Influence of Nonstoichiometry on Elastic Characteristics of Metastable β-WC1 – x Phase in Ion Plasma Condensates / Technical Physics Letters. – 2016. - Vol. 42, Is. 9, pp. 909–911.
20. Volkov O. Study of heat deformation influence in surface strain hardening of steel by thermofriction processing / O.A. Volkov // Eastern-European journal of enterprise technologies. – 2016. – Vol. 2. - № 5 (80). - P. 38-44
21. Kostyk V.O. Modeling of the case depth and surface hardness of steel during ion nitriding/ Muzahem Khalaf Mohanad, V.O. Kostyk, D.A. Domin, K.A. Kostyk // Eastern-European journal of enterprise technologies. – 2016. –Vol. 2. - № 5 (80). - P. 45–49.

Proposals for joint work and research

We invite you to education.

Also we invite scientific and industrial organizations to cooperate in the field of development and introduction of new materials, coatings, the methods of quality, structure and properties assessment.

We develop and participate in educational projects, projects of establishing of joint laboratories and research centers.

We ready to take on the teaching postgraduate and graduate students from abroad.