

International Workshop  
**Interplay of Mechanics, Tribology  
and Materials Science**

**04.-06. September 2023**

**Venue:**  
Samarkand State University  
Engineering Physics Institute  
Room 114

**Organizer:**

**Prof. Dr. Valentin L. Popov**  
Technische Universität Berlin  
Germany

**Prof. Dr. Kh. Khudoyazarov**  
Samarkand State University,  
Uzbekistan

# Program

## September 04

8:30 – 9:00	Registration
9:00 – 9:10	<b>Welcome address by Rector of Samarkand State University</b> <i>Professor Rustam Ibragimovich Khalmuradov</i>
9:10 – 9:20	<b>Welcome address on behalf of the International Tribology Council</b> <i>Professor Mitjan Kalin</i>
9:20 – 9:25	<b>Opening:</b> <i>V.L. Popov and K. Khudoynazarov</i>
	<i>Chair: V.L. Popov</i>
9:25 – 9:55	J. Luo <b>Research progress on solid-liquid combined superlubricity (SLCS)</b> <i>State Key Laboratory of Tribology in Advanced Equipment, Tsinghua University, Beijing, China</i>
9:55 - 10:25	M. Kalin <b>Real contact area and load-carrying capacity of hard multi-asperity surfaces</b> <i>Laboratory for Tribology and Interface Nanotechnology, University of Ljubljana, Slovenia</i>
10:25 - 10:55	M. Nosonovsky <sup>a,b</sup> <b>Triboinformatics: Machine Learning methods in Tribology and friction-induced instabilities"</b> <sup>a</sup> <i>Infochemistry Scientific Center, ITMO University, St. Petersburg, Russia</i> <sup>b</sup> <i>Department of Mechanical Engineering, University of Wisconsin–Milwaukee, USA</i>
10:55 - 11:25	<i>Coffee break</i>
	<i>Chair: J. Luo</i>
11:25 - 11:55	V.L. Popov <b>Contact Mechanics for Everybody: How to Apply Method of Dimensionality Reduction to Non-Axisymmetric Homogeneous and Power-Law Graded Elastic Bodies</b> <i>Institute of Applied Mechanics, Technische Universität Berlin, Germany</i>
11:55 - 12:20	<u>J.-H. Horng*</u> , J.-L. Lin, T.-N. Ta <b>Utilizing Vibration Analysis for Friction Prediction and Scuffing Prevention.</b> <i>Department of Power Mechanical Engineering, National Formosa University, Taiwan (ROC)</i>
<b>12:20 – 12:25</b>	<b>Conference Photo</b>
12:25 - 13:50	<i>Lunch</i>
	<i>Chair: M. Kalin</i>
13:50 - 14:15	S.M. Aizikovich, P.A. Lapina <b>On the equivalence of models of an inhomogeneous elastic foundations</b> <i>Don State Technical University, Rostov-on-Don, Russia</i>
14:15 - 14:40	M. Popov <b>Frictional phenomena: Micro or Macro?</b> <b>Macro-scale effects in dry friction: a mini-review</b> <i>Technische Universität Berlin, Germany</i>
14:40 - 15:05	<u>I.A. Lyashenko</u> , V.L. Popov <b>The effect of the angle between direction of motion of indenter and elastomer surface on adhesive contact properties: experiment and mathematical model</b> <i>Institute of Applied Mechanics, Technische Universität Berlin, Germany</i>
15:05 – 15:35	<i>Coffee break</i>

Chair: V. Romanova

15:35 -16:05

A.I. Dmitriev, A.R. Shugurov, Yu.M. Koroteev

**Development of a multilayer coating on the base of TiAlTaSiN: experiment and simulation**

*Institute of Strength Physics and Materials Science, Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia*

10:05 – 16:30

V.A. Romanova\*, R.R. Balokhonov

**Mesoscale deformation-induced surface roughening in polycrystalline metals. Experiment and simulation**

*Institute of Strength Physics and Materials Science, Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia*

16:30 – 16:55

K.S. Sultanov

**Contact interaction of the underground pipeline with soil under dynamic impacts**

*Institute of Mechanics and Seismic Stability of Structures named after M.T. Urazbaev of the Academy of Sciences of the Republic of Uzbekistan*

19:00

**Conference dinner**

## September 05

Chair: S.M. Aizikovich

9:00 - 9:30

Kh. Khudoynazarov

**Longitudinal-radial vibrations of a three-layer cylindrical viscoelastic shell, with rigid contacts between layers**

*Samarkand State University, Uzbekistan*

9:30 – 9:55

Q. Li

**A numerical and experimental study on edge effect in non-adhesive and adhesive contacts**

*Institute of Mechanics, Technische Universität Berlin, Germany*

9:55 -10:20

Fabian Forsbach, Emanuel Willert

**A General Approximate Solution for the Slightly Non-Axisymmetric Normal Contact Problem of Layered and Graded Elastic Materials**

*Institute of Applied Mechanics, Technische Universität Berlin, Germany*

10:20 – 10:50

Coffee break

Chair: Kh. Khudoynazarov

10:50 – 11:15

V.A. Skripnyak, M.O. Chirkov, E.G. Skripnyak, V.V. Skripnyak

**Mechanical response of layered structures with internal Layers from metamaterials to dynamic loadings**

*National Research Tomsk State University, Tomsk, Russia*

11:15 – 11:35

V.V. Skripnyak, K.V. Iohim, V.A. Skripnyak

**Simulation of deformation and fracture of alpha titanium alloys under dynamic punching**

*National Research Tomsk State University, Tomsk, Russia*

11:35 – 11:55

A.M. Poliakov, V.I. Pakhaliuk

**In Silico Analysis of an Articular Cartilage Regenerative Rehabilitation under Conditions of Mesenchymal Stem Cells Implantation and Their Mechanical Stimulation**

*Laboratory of Biomechanics, Sevastopol State University, Sevastopol, Russia*

11:55 – 13:20

Lunch

Chair: V.A. Skripnyak

13:20 - 13:45

A.Yu. Smolin, G.M. Eremina, I.P. Martyshina

**Simulation of bone tissues at their contact with a dental implant under shock wave treatment**

*Institute of Strength Physics and Materials Science, Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia*



13:45 - 14:10	I. Mirzaev <sup>1</sup> , K. Sagdiev <sup>2</sup> , A. Yuvmitov <sup>2</sup> , M. Turdiev <sup>1</sup> , B. Egamberdiyev <sup>3</sup> <b>Experimental determination of the Amonton-Coulomb dynamic coefficient of dry friction</b> <sup>1</sup> Tashkent State Transport University, Uzbekistan, <sup>2</sup> Institute of Mechanics and Seismic Stability of Structures named after M.T. Urazbaev of the Academy of Science of the Republic of Uzbekistan, Tashkent, Uzbekistan <sup>3</sup> Fergana Polytechnic Institute, Fergana, Uzbekistan
14:10 – 14:35	G. Purcek <sup>1</sup> , M. Demirtas <sup>2</sup> , H. Yanar <sup>1</sup> , K.V. Ivanov <sup>3</sup> , V.E. Ovcharenko <sup>3</sup> <b>Effect of pulsed electron beam irradiation on the microstructure, mechanical and tribological properties of Ni3Al-TiC composite</b> <sup>1</sup> Department of Mechanical Engineering, Karadeniz Technical University, Trabzon, Turkey <sup>2</sup> Department of Mechanical Engineering, Recep Tayyip Erdogan University, Rize, Turkey <sup>3</sup> Institute of Strength Physics and Materials Science, Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia
14:35 – 15:00	T.O. Almataev <sup>1</sup> , S.A. Yusupov <sup>1</sup> , N.T. Almataev <sup>1</sup> , Kh.R. Odilov <sup>1</sup> , M. F. Wani <sup>2</sup> <b>Study of tribotechnical properties of filled polymeric composite materials</b> <sup>1</sup> Andijan Machine-Building Institute, Uzbekistan. <sup>2</sup> HAG Professor of NIT, Sirinagar, India,
15:00 – 15:30	Coffee break
	Chair: A.Yu.Smolin
15:30 – 15:55	R.R. Balokhonov, V.A. Romanova <b>A numerical-experimental analysis of deformation and fracture in an Al-Si alloy fabricated by electron beam wire-feed additive manufacturing</b> Institute of Strength Physics and Materials Science, Siberian Branch of the Russian Academy of Sciences, Tomsk, Russia
15:55 – 16:20	S.V. Fedorov <b>Structural-energy evolution of friction contact, elementary tribosystem and mechanical (nano) quantum</b> Kaliningrad State Technical University, Russia
16:20 – 16:45	K. Mamasoliev <sup>1</sup> , M. Mirsaidov <sup>2</sup> <b>Mathematical model and analytical solution of the contact problem on the bending of a plate laying on a nonhomogeneous combined base</b> <sup>1</sup> Samarkand State University of Architecture and Construction; <sup>2</sup> National Research University - Tashkent University of Irrigation and Agricultural Mechanization Engineers; <sup>3</sup> Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan.
16:45 – 17:05	V.P. Kuznetsov, I.A. Vorontsov, M.S. Karabanalov, M.S. Khadyev <b>Hardening of the surface layer of X20Cr13 steel by alloying with WC-Co tool material through friction stir processing</b> Ural Federal University, Yekaterinburg, Russia

## September 06

	Chair: M.Mirsaidov
9:00 - 9:20	A. Yuldashev, D. Kuldoshev, N. Djuraeva, A. Urinov, M. Mirzaeva <b>Theoretical justification of deformation process and the soil movement in the area affected on chisel plow</b> Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan
9:20 – 9:40	R. Indiaminov <sup>1</sup> , A. Narkulov <sup>1</sup> , A. Abdullaev <sup>2</sup> , R. Butaev <sup>3</sup> , J. Shodmonov <sup>4</sup> <b>Magnetoelastic deformation of nonferromagnetic thin plates in a nonstationary magnetic field</b> <sup>1</sup> Samarkand branch of the Tashkent University of Information Technologies, Samarkand, <sup>2</sup> Tashkent University of Information Technologies, Tashkent, <sup>3</sup> Jizzakh State Pedagogical Universities, Jizzakh, <sup>4</sup> Kattakurgan branch of Samarkand State University, Kattakurgan, Uzbekistan

9:40 -10:00	R.A. Abirov <b>On strength of materials with initial crack</b> <i>Institute of mechanics and earthquake engineering, Tashkent, Uzbekistan</i>
10:00 – 10:20	G.M. Panahov, E.M. Abbasov*, I.J. Mammadov <b>Diffusive mass transfer in porous media during in-situ gas generation</b> <i>Institute of Mathematics and Mechanics, Ministry of Science and Education of Azerbaijan Republic</i>
10:20 – 10:50	<i>Coffee break</i>
	<i>Chair: R.A. Abirov</i>
10:50 – 11:10	V.P. Kuznetsov, A.S. Skorobogatov, <u>G.S. Anisimova</u> <b>Impact of heat removal from the sliding indenter contact zone on the coefficient of friction and structure formation during the nanostructuring burnishing of X20Cr13 steel</b> <i>Ural Federal University, Yekaterinburg, Russia</i>
11:10 – 11:30	V.P. Kuznetsov <sup>1</sup> , <u>I.V. Tatarintsev</u> <sup>2</sup> , A.V. Korelin <sup>1</sup> <b>Analysis of power spectrum density for controlling a multi-transition finishing of frictional surfaces by burnishing and micro cavities deformation</b> <i><sup>1</sup> Ural Federal University, Yekaterinburg, Russia <sup>2</sup> Kurgan State University, Kurgan, Russia</i>
11:30 – 11:50	<u>A. Polatov</u> , A. Ikramov <b>Effect of geometric features on the stress state of unidirectional composites</b> <i>National University of Uzbekistan, Tashkent, Uzbekistan</i>
11:50 – 12:10	N. Tursunov <b>The Steel dephosphorization process research for railway castings in an induction crucible furnace</b> <i>Materials Science and Mechanical Engineering Department, Tashkent State Transport University, Uzbekistan</i>
12:10 – 13:40	<i>Lunch</i>
	<i>Chair: Z.M. Malikov</i>
13:40 - 14:00	A.M. Shukurov <b>Non-stationary vibrations of a thick-wall elastic spherical shell in acoustic half-space</b> <i>Karshi State University, Karshi, Uzbekistan</i>
14:00 - 14:20	O. Zhelezkov, E. Martynov, M. Kharchenko, R. Dema <b>Prediction of the "Screw-nut" gear life</b> <i>Magnitogorsk state technical University named after G. I. Nosov, Magnitogorsk, Russia</i>
14:20 – 14:40	M.M. Mirsaidov <sup>1,2</sup> , <u>A.N. Ishmatov</u> <sup>1</sup> , B.Kh. Urinov <sup>1</sup> , I.A.Khazratkulov <sup>1</sup> <b>Evaluation of nonlinear oscillations of plane structures with consideration of internal dissipation</b> <i><sup>1</sup> National Research University - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Tashkent, Uzbekistan; <sup>2</sup> Institute of Mechanics and Seismic Stability of Structures, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan.</i>
14:40 – 15:10	<i>Coffee break</i>
	<i>Chair: I.Mirzayev</i>
15:10 – 15:30	Z.M. Malikov <sup>1</sup> , F.Kh. Nazarov <sup>1</sup> , <u>M.E. Madaliev</u> <sup>1</sup> , D.P. Navruzov <sup>2</sup> <b>Numerical investigation of the turbulent structure in the NACA0012 aerodynamic air-flow wake at low Reynolds numbers on the basis of a two fluid model</b> <i><sup>1</sup> Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan <sup>2</sup> Bukhara Institute of Natural Resources Management, National Research University "TI-IAME", Bukhara, Uzbekistan</i>

15:30 – 15:50	<p>Z.M. Malikov <sup>1</sup>, D.P. Navruzov <sup>2</sup>, <u>M.E. Madaliev</u> <sup>1</sup>, N.Sh. Hamroyev <sup>2</sup>  <b>Simulation of swirling jet flows based on two fluid turbulence model</b>  <sup>1</sup> <i>Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan</i>  <sup>2</sup> <i>Bukhara Institute of Natural Resources Management, National Research University "TI-IAME", Bukhara, Uzbekistan</i></p>
15:50 – 16:10	<p>M. Mirsaidov<sup>1,2</sup>, O. Dusmatov<sup>3</sup> and <u>M. Khodjabekov</u><sup>4</sup>  <b>Stability of longitudinal vibrations of a rod with a liquid section dynamic absorber</b>  <sup>1</sup> <i>National Research University - Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Tashkent, Uzbekistan</i>  <sup>2</sup> <i>Institute of Mechanics and Seismic Stability of Structures of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan</i>  <sup>3</sup> <i>Samarkand State University, Samarkand, Uzbekistan</i>  <sup>4</sup> <i>Samarkand State University of Architecture and Construction named after Mirzo Ulug'bek, Samarkand, Uzbekistan</i></p>
16:10 – 16:20	<p><i>Closing</i></p>