

European Structural Integrity Society (ESIS)
Karpenko Physico-Mechanical Institute
of the National Academy of Sciences of Ukraine
Ukrainian Society on Fracture Mechanics
Lviv Polytechnic National University

6th International Conference
**“Fracture Mechanics of Materials
and Structural Integrity”**



PROGRAMME

June 3–6, 2019



Lviv, Ukraine

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Ya. Khaburskyi, T. Lenkovskyi, V. Poznyakov,
I. Shtoyko, B. Stasyuk, V. Uchanin, O. Zynyuk**

MONDAY, JUNE 3

18:00	Registration and Welcome Reception Location: Premier Hotel Dnister; (6 Mateika Str., Lviv) Dnister restaurant
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TUESDAY, JUNE 4

8:30–9:00	Registration Location: Lviv Polytechnic National University (12 Bandera Str.), Main Building
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9:00–9:40	Opening Ceremony Location: Lviv Polytechnic National University Main Building, Assembly Hall
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9:40–10:40	Session: Fracture and Strength of Materials Location: Lviv Polytechnic National University Main Building, Assembly Hall
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9:40 **Development of investigations on fracture mechanics of materials and structural integrity: achievements and perspectives**

Volodymyr Panasyuk

Karpenko Physico-Mechanical Institute of NASU, Ukraine

10:00 **The mechanism for counteracting cracking of high-manganese steels with austenitic structure**

Leszek A. Dobrzanski

Medical and Dental Engineering Centre for Research, Design and Production, Science Centre ASKLEPIOS, Poland

10:20 **Fracture mechanics study of cementitious materials reinforced with carbon nanotubes and nanofibers**

Emmanuel E. Gdoutos¹, Maria S. Konsta-Gdoutos²

¹*Academy of Athens, Athens, Greece*

²*University of Texas at Arlington, Arlington, Texas, USA*

10:40–11:00

Coffee Break

Location: Lviv Polytechnic National University
Main Building, Room 231

11:00–13:00

Session: Fracture and Strength of Materials

Location: Lviv Polytechnic National University
Main Building, Assembly Hall

- 11:00 **Crack propagation sensitivity index of quasistatic and cyclic loaded engineering structures**
Laszlo Toth
TVE Engineering Ltd., Hungary
- 11:20 **To the problem of the subsurface defects detection: theory and experiment**
Zinoviy Nazarchuk, Leonid Muravsky,
Dozyslav Kuryliak
Karpenko Physico-Mechanical Institute of NASU, Ukraine
- 11:40 **Application of the theory of large deformation in uniaxial tension - compression**
Andrzej Kurek ¹, Justyna Koziarska ¹,
Tadeusz Łagoda ¹, Karolina Łagoda ²
¹ *Politechnika Opolska, Poland*
² *Politechnika Wroclawska, Poland*
- 12:00 **Electrodynamic treatment (EDT) of welded joints by electric current pulses as an effective method for regulation of their stressed-strain states**
Leonid Lobanov, Nikolai Pashchin
Paton Electric Welding Institute of NASU, Ukraine
- 12:20 **Influence of the inclusion shape and the constraints level on damage to the elementary cell**
Jaroslaw Galkiewicz
Kielce University of Technology, Poland
- 12:40 **Peculiarities of the crack initiation and propagation in different specimen types**
Eugene Kondryakov, Olexandr Panasenko,
Andriy Kravchyk, Valeriy Kharchenko
G.S. Pisarenko Institute for Problems of Strength of NASU, Ukraine

13:00–14:20	Lunch Location: Premier Hotel Dnister; (6 Mateika Str., Lviv) Dnister restaurant
14:20–16:00	Session: Fracture and Strength of Materials Location: Lviv Polytechnic National University Main Building, Room 226
14:20	Stress-strain analysis of thin-walled structures of complex geometrical shape and prediction of destructive loads Roman Kushnir, <u>Bogdan Drobenko</u> , Mykhaylo Marchuk <i>Pidstryhach Institute for Applied Problems of Mechanics and Mathematics of NASU, Ukraine</i>
14:40	Mixed mode (I+II, I+III) fatigue crack growth description in S355/P355NL1 steel <u>Grzegorz Lesiuk</u> ¹ , Dariusz Rozumek ² , Jose A.F.O. Correia ³ , Mieczysław Szata ⁴ , Abilio M.P. De Jesus ³ ¹ <i>Wroclaw University of Science and Technology, Faculty of Mechanical Engineering, Department of Mechanics, Materials Science and Engineering, Wrocław, Poland</i> ² <i>Department of Mechanics and Machine Design, Opole University of Technology, Poland</i> ³ <i>INEGI/Faculty of Engineering, University of Porto, Portugal</i> ⁴ <i>Wroclaw University of Science and Technology, Faculty of Technology and Natural Sciences, Legnica, Poland</i>
15:00	Numerical analyses of biomass reinforced composite bridging element <u>Róbert Beleznai</u> , Zoltán Siménfalvi, Gábor L. Szepesi <i>University of Miskolc, Hungary</i>
15:20	Influence of stress ratio on functional fatigue of pseudoelastic NiTi alloy <u>Volodymyr Iasnii</u> , Petro Yasniy <i>Terнопil National Ivan Pul'uj Technical University, Ukraine</i>

- 15:20 **Influence of the atmosphere corrosion on the fatigue life of welded T-joints treated by high frequency mechanical impact**
Vitalii Knysh, Sergii Solovei, Lyudmila Nyrkova,
Ilya Klochkov, Sviatoslav Motrunich
Paton Electric Welding Institute of NASU, Ukraine

16:00–16:20

Coffee Break

Location: Lviv Polytechnic National University
Main Building, Room 231

16:20–18:20

Session: Fracture and Strength of Materials

Location: Lviv Polytechnic National University
Main Building, Room 226

- 16:20 **Determination of GTN parameters of SENT specimen during ductile fracture**
Yassine Chahboub¹, Szavai Szabolcs¹, Zoltan Bezi²
¹ *University of Miskolc, Hungary*
² *Bay Zoltan Institute, Hungary*
- 16:40 **Influence of a local distributions of stress and strain before tip of a crack at mechanisms of fracture of HARDOX-400 steel**
Ihor Dzioba, Robert Pała
Kielce University of Technology, Poland
- 17:00 **Effect of the structure on the mechanical properties and cracking resistance of welded joints of low-alloyed high-strength steels**
Olena Berdnikova, Valery Pozniakov,
Artemii Bernatskyi, Tetiana Alekseienko, Volodymyr Sydorets
Paton Electric Welding Institute of NASU, Ukraine
- 17:20 **Evolution of the mechanical fields and fracture process of S355JR steel**
Ihor Dzioba, Sebastian Lipiec
Kielce University of Technology, Poland

17:40 **Strength of welded joints made of high-strength steel with different welding parameters**

Ihor Dzioba, Tadeusz Pała

Kielce University of Technology, Poland

18:00 **Short crack problem in delayed fracture mechanics**

Yuri Lapusta¹, Olexandr Andreikiv², Nataliya Yadzhak²

¹ *French National Centre for Scientific Research,
University of Clermont Auvergne, France*

² *Ivan Franko National University of Lviv, Ukraine*

19:00

Excursion

WEDNESDAY, JUNE 5

9:00–10:40

Special session: Environmentally Assisted Cracking

Location: Lviv Polytechnic National University
Main Building, Room 226

- 9:00 **Main factors causing stress corrosion cracking & hydrogen-induced cracking. Gaping in our understanding**
Mimoun Elboujdaini
Integrated Mechanical Material Corrosion Services (IM2C), USA – Canada
- 9:20 **Specific effects of hydrogen concentration on resistance to fracture of ferrite-pearlitic pipeline steels**
Ihor Dmytrakh, Andriy Syrotyuk, Rostyslav Leshchak
Karpenko Physico-Mechanical Institute of NASU, Ukraine
- 9:40 **Assessment of in-service degradation of gas pipeline steel taking into account susceptibility to stress corrosion cracking**
Olha Zvirko¹, Giovanna Gabetta²,
Oleksandr Tsyurulnyk¹, Nataliia Kret¹
¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine,*
² *Consultant, Italy*
- 10:00 **The energy approach to the evaluation of hydrogen effect on the damage accumulation**
Yaroslav Ivanytskyi^{1,2}, Yevhen Kharchenko¹,
Oksana Hembara^{1,2}, Olha Chepil^{1,2},
Yaroslav Sapuzhak², Nazar Hembara²
¹ *Lviv Polytechnic National University, Ukraine*
² *Karpenko Physico-Mechanical Institute of NASU, Ukraine*
- 10:20 **Hydrogen assisted crack initiation and propagation in nickel-cobalt heat resistant superalloys**
Aleksander Balitskii
Karpenko Physico-Mechanical Institute of NASU, Ukraine

10:40–11:00	Coffee Break Location: Lviv Polytechnic National University Main Building, Room 231
11:00–12:20	Special session: Environmentally Assisted Cracking Location: Lviv Polytechnic National University Main Building, Room 226
11:00	Developmental strategy for environmentally assisted cracking resistance of copper containing 7xxx series M. Ajay Krishnan and <u>V.S. Raja</u> <i>Indian Institute of Technology Bombay, India</i>
11:20	Influence of the gas hydrates on the rate of corrosion of pipeline <u>Lubomyr Poberezhny</u> , <u>Andrii Hrytsanchuk</u> , <u>H. Grytsyliak</u> <i>Ivano-Frankivsk National Technical University of Oil and Gas, Ukraine</i>
11:40	Prediction of the residual lifetime of gas pipelines considering the effect of soil corrosion and material degradation <u>Ivan Shtoyko</u> ¹ , <u>Jesus Toribio</u> ² , <u>Viktor Kharin</u> ² , <u>Myroslava Hredil</u> ¹ ¹ <i>Karpenko Physico-Mechanical Institute of NASU, Ukraine</i> ² <i>Fracture & Structural Integrity Research Group (FSIRG), University of Salamanca, Spain</i>
12:00	Features of stress corrosion cracking of degraded gas pipeline steels <u>Hryhoriy Nykyforchyn</u> , <u>Halyna Krechkovska</u> , <u>Oleksandra Student</u> , <u>Olha Zvirko</u> <i>Karpenko Physico-Mechanical Institute of NASU, Ukraine</i>
12:20–13:00	ESIS TC10 Meeting Location: Lviv Polytechnic National University Main Building, Room 204

13:00–14:20	<p>Lunch Location: Premier Hotel Dnister; (6 Mateika Str., Lviv) Dnister restaurant</p>
11:00–12:20	<p>Special session: Non-Destructive Evaluation Location: Lviv Polytechnic National University Main Building, Room 226</p>

- 14:20 **Role and importance of NDE in nuclear power plant life extension**
 Peter Trampus
University of Dunaujvaros, Hungary
- 14:40 **Method of acoustic emission in delayed fracture mechanics of structural materials**
 Zinoviy Nazarchuk ¹, Olexander Andreykiv ²,
 Valentyn Skalskyy ¹, Denys Rudavskyy ¹
¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine*
² *Ivan Franko National University of Lviv, Ukraine*
- 15:00 **AE technology in continuous monitoring of high-temperature pipelines at heating power plants**
 Borys Paton ¹, Leonid Lobanov ¹,
 Anatoly Nedoseka ¹, Stanislav Nedoseka ¹,
 Mihail Yaremenko ¹, Janos Gereb ²,
 Yuri Gladyshev ³, Vadim Beshun ³,
 Alexandr Bychkov ³, Alexandr Gaidukevich ³
¹ *Paton Electric Welding Institute of NASU, Ukraine*
² *VD2, Hungary*
³ *SVP “Kievskii TPP” PJSC “Kievenergo”, Ukraine*
- 15:20 **Monitoring of the wear of aircraft transmission toothed wheels by the FAM-C and FDM-A methods**
Andrzej Gębura ¹, Sylwester Kłysz ^{1,2},
 Tomasz Tokarski ¹
¹ *Air Force Institute of Technology, Poland*
² *University of Warmia and Mazury, Technical Sciences Department, Poland*

- 15:40 **Development of electromagnetic NDT methods for structural integrity assessment**
Valentyn Uchanin, Orest Ostash
Karpenko Physico-Mechanical Institute of NASU, Ukraine

16:00–16:20

Coffee Break

Location: Lviv Polytechnic National University
Main Building, Room 231

16:20–18:20

Special session: Non-Destructive Evaluation

Location: Lviv Polytechnic National University
Main Building, Room 226

- 16:20 **The String Model: a new interpretation of the metallic structures and its connected physical phenomena**
Giuseppe Nardoni, Ward Rummel, Peter Trampus
Academia NDT International, Brescia, Italy
- 16:40 **Determination of residual stresses by laser shearography method**
Leonid Lobanov, Viktor Savitsky
Paton Electric Welding Institute of NASU, Ukraine
- 17:00 **Detection of cracks in ferrous steel structures: new innovative eddy current techniques**
Valentyn Uchanin¹, Giuseppe Nardoni²
¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine*
² *I&T Nardoni Institute, Italy*
- 17:20 **Analysis of rotary mechanism fault features on the base of the spectral structure for vibration stochastic recurrence**
Ihor Javorskyj^{1,2}, Roman Yuzefovych^{2,3},
Pavlo Semenov⁴, Pavlo Kurapov³
¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine*
² *UTP University of Science and Technology, Poland*
³ *Lviv Polytechnic National University, Ukraine*
⁴ *Odessa National Maritime University, Ukraine*

17:40 **The methodology of evaluation and monitoring of the fatigue fracture at macrocrack initiation stage**

Roman Chepil, Olena Stankevych, Orest Ostash,
Bohdan Klym

Karpenko Physico-Mechanical Institute of NASU, Ukraine

18:00 **Determination of components of transient resistance of underground pipeline**

Roman Dzhala¹, Vasyl' Dzhala¹, Roman Savula²,
Oleh Senyuk¹, Bohdan Verbenets'¹

¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine*

² *Public Joint-Stock Company "UKRTRANSGAZ" –
Affiliate "Lvivtransgaz", Ukraine*

19:00

Conference Dinner

THURSDAY, JUNE 6

9:00–11:00

Workshop on Applied Mechanics

Location: Lviv Polytechnic National University
Main Building, Room 226

- 9:00 **Research progress and prospect of laser hybrid manufacturing technology**
Jianhua Yao¹, Volodymyr Kovalenko^{1,2}
¹*Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China*
²*Laser Technology Research Institute, National Technical University of Ukraine*
- 9:20 **Features of the estimation of the influence of various factors on the integrity of the RPV reactor under the action of a melt of metals during a severe accident**
A.A. Kotliarenko, A.Yu. Cirkov, V.V. Kharchenko
G.S. Pisarenko Institute for Problems of Strength of NASU, Ukraine
- 9:40 **Effect of carbon nanotubes on the properties of ceramic coating prepared by sol-gel combined laser cladding**
Qunli Zhang, Zhongzhi Yao, Jianhua Yao
Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China
- 10:00 **Research on porous structure of the implant**
Chunyan Yao, Zhongli Zheng, Wei Zhang, Yunfeng Liu
Key Laboratory of Special Purpose Equipment and Advanced Manufacturing Technology, Ministry of Education, Zhejiang University of Technology, Hangzhou Zhejiang, China

10:20 **Surface morphology analysis and wettability of steel and glass modified with graphene oxide**

Barbara Nasiłowska¹, Klaudia Olkowicz²,
Aneta Bombalska¹

¹ *Institute of Optoelectronics, Military University of Technology, Poland*

² *Institute of Precision Mechanics, Poland*

10:40 **Effects of high-frequency vibration on the micro-structure and tensile property in laser cladding of SS316L alloy**

Zhehe Yao, Xiaowen Yu, Jianhua Yao

Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China

11:00–11:20

Coffee Break

Location: Lviv Polytechnic National University
Main Building, Room 231

11:20–13:20

Workshop on Applied Mechanics

Location: Lviv Polytechnic National University
Main Building, Room 226

11:20 **Influence of gas flow on oxidation of molten pool during laser remelting under open-air condition**

Gaolin Yang, Jianhua Yao, Zhengting Ye

Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China

11:40 **Advanced deposition characteristics of diamond-reinforced Cu matrix composite coating by supersonic laser deposition**

Lijuan Wu, Jianhua Yao, Bo Li, Weilin Wang,
Xuanjie Huang, Qunli Zhang

Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China

- 12:00 **Consideration of the effect of biaxial loading and short cracks on RPV steel fracture toughness**
V. G. Sidyachenko, A. A. Kotliarenko
G.S. Pisarenko Institute for Problems of Strength of NASU, Ukraine
- 12:20 **Study on laser cladding Fe-based wear resistant coating on inner wall**
Jianhua Yao¹, Zhongyao Cai¹, Zhijun Chen¹,
Volodymyr Kovalenko^{1,2}
¹*Institute of Laser Advanced Manufacturing, Zhejiang University of Technology, China*
²*Laser Technology Research Institute, National Technical University of Ukraine*
- 12:40 **Influence of pipeline steel texture on macro- and micromechanisms of its impact fracture**
Yevstakhiy Kryzhanivskyy¹,
Liubomyr Poberezhny¹, Pavlo Maruschak²,
Mykhailo Lyakh¹, Volodymyr Slobodyan¹,
Vasyl Zapukhliak¹
¹*Ivano-Frankivsk National Technical University of Oil and Gas, Ukraine*
²*Ternopil Ivan Pul'uj National Technical University, Ukraine*
- 13:00 **Role of in-service conditions in operational degradation of mechanical properties of portal cranes steel**
Oleksiy Nemchuk¹, Myroslava Hredil²,
Vitaliy Pustovoy¹, Oleksandr Nesterov¹
¹*Odessa National Maritime University, Ukraine*
²*Karpenko Physico-Mechanical Institute of NASU, Ukraine*

13:00–14:20

Lunch

Location: Premier Hotel Dnister;
(6 Mateika Str., Lviv) Dnister restaurant

14:20–16:20

Workshop on Applied Mechanics

Location: Lviv Polytechnic National University
Main Building, Room 226

- 14:20 **Microcrack under internal pressure at dislocation defect**
Mykola Stashchuk ¹, Nataliya Hembara ²,
Vitalii Kovalchuk ³
¹ *Karpenko Physico-Mechanical Institute of NASU, Ukraine*
² *Ukrainian Academy of Printing, Ukraine*
³ *Lviv branch of Dnipropetrovsk National University of Railway Transport named after Academician V. Lazaryan, Ukraine*
- 14:40 **Corrosion of drill pipes in high mineralized formation waters**
Igor Chudyk ¹, Lyubomyr Poberezhny ¹,
Andrii Hrytsanchuk ¹, Liubov Poberezhna ²
¹ *Ivano-Frankivsk National Technical University of Oil and Gas, Ukraine*
² *Ivano-Frankivsk National Medical University, Ukraine*
- 15:00 **Qualimetric analysis of pipelines with surface corrosion defects**
Roman Dzhala ¹, Volodymyr Yuzevych ¹,
Vitalii Lozovan ¹, Andriy Mytsyk ²,
Ruslan Skrynkovskyy ³,
Mykhailo Yasynskiy ⁴
¹ *Karpenko Physico-mechanical Institute of NASU, Ukraine*
² *Public Joint-Stock Company “UKRTRANSGAZ” – Affiliate “Lvivtransgaz”, Ukraine*
³ *Lviv University of Business and Law, Ukraine*
⁴ *Ukrainian Academy of Printing, Ukraine*

15:20 **Fracture behavior of dissimilar welding of Inconel 600**

Teresita Sánchez Cruz ¹, Sebastian Jaureguizahar ²,
Heriberto Granados Becerra ³,
Victor Hugo López Morelos ³, Orest Bilyy ¹,
Jorge González-Sánchez ¹

¹ *Centre for Corrosion Research of Autonomous University of Campeche, Mexico*

² *Materials Science and Technology Research Institute INTEMA, Argentina*

³ *Institute for Research in Metallurgy and Materials, UMSNH; San Nicolás University of Michoacana, Mexico*

15:40 **Effect of the application of an external magnetic field during the process of fusing welding in stainless steel duplex 2205 in the resistance to cracking by corrosion fatigue**

Alexandro De León, Jorge González-Sánchez,
Orest Bilyy

Centro de Investigación en Corrosión, CICORR-UAC, Mexico

16:00 **Requirements for hydrogen resistance of materials in CI engine toxic substances powered by biofuels**

Jacek Jaroslaw Eliasz ¹, Alexander Balitskii ²,
Tomasz Osipowicz ¹, Karol Franciszek Abramek ¹

¹ *West Pomeranian University of Technology in Szczecin, Poland*

² *Karpenko Physico-Mechanical Institute of NASU, Ukraine*

16:20

Closing Ceremony

Location: Lviv Polytechnic National University
Main Building, Room 226

