Wrocław University
of Science and Technology

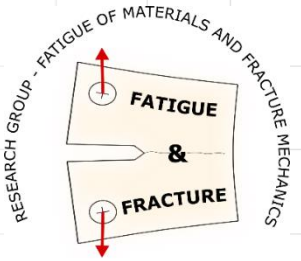
RESEARCH GROUP OF FATIGUE FRACTURE OF MATERIALS AND STRUCTURES

DEPARTMENT OF MECHANICS, MATERIALS SCIENCE AND BIOMEDICAL ENGINEERING

HR EXCELLENCE IN RESEARCH

Wrocław University
of Science and Technology

RESEARCH ACTIVITIES:



- Fundamental problems in **fracture mechanics** (metals, non-metals, polymers, composite materials, fibre-metal laminates)
- **Fatigue** of metals, non-metals and composite materials (including energy approach)
- **Structural integrity** of materials and structures
- **Experimental** methods in fatigue and fracture of materials
- Fatigue and fracture of **hyperelastic, additive** and **biomedical** materials
- **Multiaxial** fatigue and **mixed mode** FCGR
- Finite element modeling of materials and their fracture
- Machine learning

GROUP MEMBERS

HEAD
PhD. DSc. Eng.
Grzegorz Lesiuk,
Associate Professor

Honorary Head
PhD. DSc. Eng. Mieczysław Szata,
Professor, Former Director of the
Institute of Materials Science and
Applied Mechanics

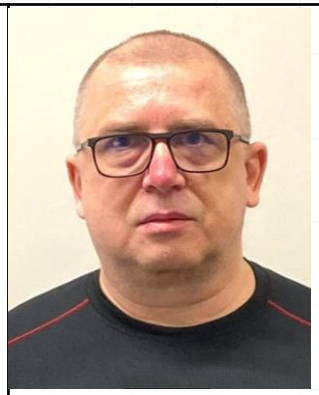
HR EXCELLENCE IN RESEARCH

Wrocław University
of Science and Technology

GROUP MEMBERS

- fractal description in the phenomena of solid mechanics
- experimental methods in the area of strength of materials
- magnetic effects in mechanically loaded materials

Dr. Piotr Kotowski



- Biomedical engineering:
  - FEM modeling
  - experimental approach

Dr. Przemysław Stróżyk

- experimental methods in the mechanical and biomechanical studies
- biomechanics of the stomatognathic system

Dr. Agnieszka Szust

GROUP MEMBERS

- FEM modeling (also XFEM)
- Composite materials, FMLs
- Fracture Mechanic
- Machine learning, evolution algorithms, automatized numerical simulations, user subroutines

Michał Smolnicki, M. Sc.

- Experimental methods in the area of strength of materials
- Composites materials:
  - manufacturing processess including pultrusion and infusion
  - failure criteria
  - fatigue analysis

Szymon Duda, M. Sc.

- Composite materials:
  - manufacturing processess including pultrusion, RTM, infusion
  - description of mechanical properties

Paweł Zielonka, M. Sc.

- Additive manufactured materials – description of mechanical properties
- Multiaxial fatigue of metalic materials

Szymon Dziuba, M. Sc.

GROUP MEMBERS

- Polyurethane materials
- Multiaxial strength

Krzysztof Junik, M.Sc.

- Fatigue behaviour of metals
- Multiaxial loading testing
- Influence of microstructure on fatigue strength of materials

Monika Duda, M.Sc.

- Biomedical materials testing

Anna Wybraniec, M.Sc.

- Electronics, electromechanics, informatics
- 3d printing & design

Tomasz Markiewicz

HR EXCELLENCE IN RESEARCH

Wrocław University of Science and Technology

SELECTED RECENT PAPERS (2022)

	Impact Factor
Michał J. Smolnicki, **Grzegorz Lesiuk**, **Szymon J. Duda**, Abílio M. P. De Jesus. A review on finite-element simulation of fibre metal laminates. Archives of Computational Methods in Engineering. 2022, s. 1-15.	***8.171***
M. Azeem, H. Haji. Ya*, M. Azad. A. Mukesh Kumar, P. Stabla, **M. Smolnicki**, L. Gemi, R. Khan*, T. Ahmed, Q. Ma*, Md Sadique, A. Mokhtar, M. Mustapha. Application of filament winding technology in composite pressure vessels and challenges: a reviev. Journal of Energy Storage. 2022, vol. 49, art. 103468, s. 1-22.	**8.907**
Michał J. Smolnicki, Szymon J. Duda, Paweł J. Stabla, Tomasz Osiecki. Mechanical investigation on interlaminar behaviour of inverse FML using acoustic emission and finite element method. Composite Structures. 2022, vol. 294, art. 115810, s. 1-13.	***6.603***
Konrad Gruber, Patrycja Szymczyk-Ziółkowska, **Szymon P. Dziuba**, **Szymon J. Duda**, **Paweł J. Zielonka**, Stanislav Seitl*, **Grzegorz Lesiuk** Fatigue crack growth characterization of Inconel 718 after additive manufacturing by laser powder bed fusion and heat treatment. International Journal of Fatigue. 2023	**5.489**
Victor Ribeiro, José A. F. O. Correia, António Mourão, **Grzegorz Lesiuk**, Aparecido C. Gonçalves, Abílio M. P. De Jesus, Filippo Berto. Fatigue crack growth modelling by means of the strain energy density-based Huffman model considering the residual stress effect. Engineering Failure Analysis. 2022, vol. 140, art. 106543, s. 1-14.	***3.634***
Dariusz Rozumek, Janusz Lewandowski, **Grzegorz Lesiuk**, Zbigniew Marciniak, José A. F. O. Correia, Wojciech Macek. The energy approach to fatigue crack growth of S355 steel welded specimens subjected to bending. Theoretical and Applied Fracture Mechanics. 2022, vol. 121, art. 103470, s. 1-9.	***4.374***
Bruno Pedrosa, José A. F. O. Correia, **Grzegorz Lesiuk**, Carlos Rebelo, Milan Veljkovic. Fatigue crack growth modelling for S355 structural steel considering plasticity-induced crack-closure by means of UniGrow model. International Journal of Fatigue. 2022, vol. 164, art. 107120, s. 1-13.	***5.489***
Monika M. Duda, Dariusz Rozumek, **Grzegorz Lesiuk**, **Michał J. Smolnicki**, Bartosz A. Babiarczuk, Joanna B. Warycha Fatigue crack growth under mixed-mode I + II and I + III in heat treated 42CrMo4 steel. International Journal of Fracture. 2022, vol. 234, s. 235-248.	**2.635**

3.325

SELECTED RECENT PAPERS (2022)

	Impact Factor
▪ Paweł J. Stabla, Marek Lubecki, **Michał J. Smolnicki** The effect of mosaic pattern and winding angle on radially compressed filament-wound CFRP composite tubes. Composite Structures. 2022, vol. 292, art. 115644, s. 1-13.	***6.603***
▪ **Monika M. Duda**, Dariusz Rozumek, **Michał J. Smolnicki, Anna Wybraniec**. Influence of various heat treatments on fatigue crack growth in 42CrMo4 steel under mixed modes I + II and I + III. International Journal of Fatigue. 2022, vol. 165, art. 107173, s. 1-10.	***5.489***
▪ **Monika M. Duda**, Dariusz Rozumek, **Grzegorz Lesiuk**, **Michał J. Smolnicki**, Bartosz A. Babiarczuk, Joanna B. Warycha Fatigue crack growth under mixed-mode I + II and I + III in heat treated 42CrMo4 steel. International Journal of Fracture. 2022, vol. 234, s. 235-248.	**2.635**

SELECTED RECENT PAPERS (2021)

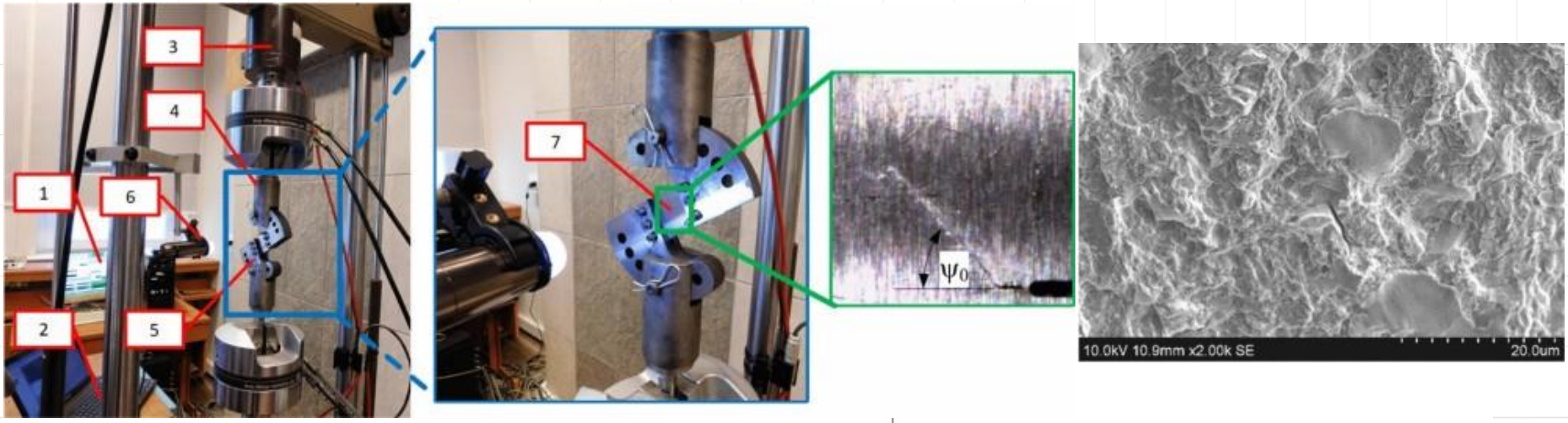
	Impact Factor
Lesiuk, G., Nykyforchyn, H., Zvirko, O., Mech, R., Babiarczuk, B**., Duda, S.,** ... & Correia, J. A. (2021). Analysis of the Deceleration Methods of Fatigue Crack Growth Rates under Mode I Loading Type in Pearlitic Rail Steel. Metals, 11(4), 584.	**2.117**
Stabla, P., **Smolnicki, M**., & Błażejewski, W. (2021). The Numerical Approach to Mosaic Patterns in Filament-Wound Composite Pipes. Applied Composite Materials, 28(1), 181-199.	**2.199**
Barcikowski, M., **Lesiuk, G**., Czechowski, K., & **Duda, S**. (2021). Static and flexural fatigue behavior of GFRP pultruded rebars. Materials, 14(2), 297.	**3.623**
*Królicka, A., **Lesiuk, G**., Radwański, K., Kuziak, R., Janik, A., Mech, R., & Zygmunt, T. (2021). Comparison of Fatigue Crack Growth Rate: Pearlitic Rail versus Bainitic Rail. International Journal of Fatigue, 106280.. **IF=4.369***	***5.186***
*Gao, J. W., Dai, G. Z., Li, Q. Z., Zhang, M. N., Zhu, S. P., Correia, J. A., **G.Lesiuk** & De Jesus, A. M. (2021). Fatigue assessment of EA4T railway axles under artificial surface damage. International Journal of Fatigue, 146, 106157.*	***5.186***
Dantas, R., Correia, J., **Lesiuk, G.,** Rozumek, D., Zhu, S. P., de Jesus, A., ... & Berto, F. (2021). Evaluation of multiaxial high-cycle fatigue criteria under proportional loading for S355 steel. Engineering Failure Analysis, 120, 105037**.**	***3.114***
Junik, K., Lesiuk, G., Barcikowski, M., Błażejewski, W., Niemiec, A., Grobelny, M., Correia, J. A. F. O. (2021). Impact of the hardness on the selected mechanical properties of rigid polyurethane elastomers commonly used in suspension systems. Engineering Failure Analysis, 121, 105201	***3.114***
Gao, J. W., Yu, M. H., Liao, D., Zhu, S. P., Han, J., **Lesiuk, G**., & De Jesus, A. M. (2021). Fatigue and damage tolerance assessment of induction hardened S38C axles under different foreign objects. International Journal of Fatigue, 106276	***5.186***
Błażejewski, W., Barcikowski, M., Lubecki, M., Stabla, P., Bury, P., Stosiak, M., & **Lesiuk, G.** (2021). The Mechanical Investigation of Filament-Wound CFRP Structures Subjected to Different Cooling Rates in Terms of Compressive Loading and Residual Stresses—An Experimental Approach. Materials, 14(4), 1041**.**	***3.325***

SELECTED RECENT PAPERS (2021)

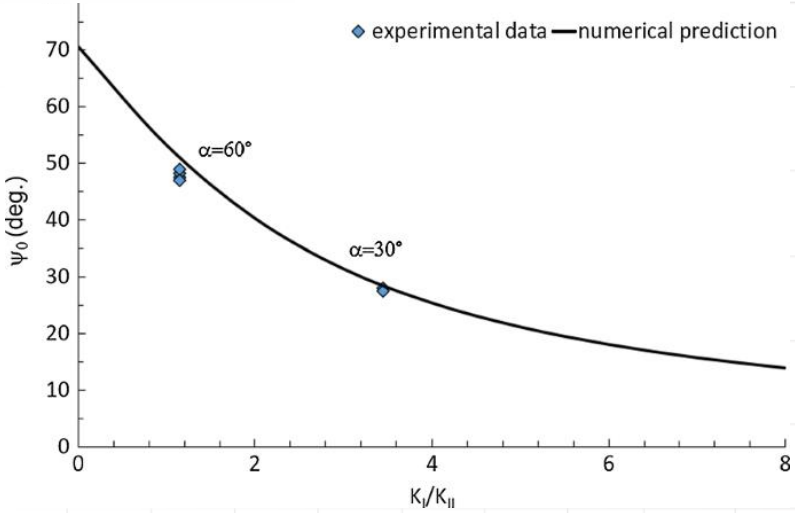
	Impact Factor
Szymon Duda, Michał Smolnicki, Tomasz Osiecki, **Grzegorz Lesiuk** Determination of fracture energy (mode I) in the inverse fiber metal laminates using experimental–numerical approach. International Journal of Fracture. 2021, s. 1-10.	**2.374**
Monika Duda, Dariusz Rozumek, **Grzegorz Lesiuk**, **Michał Smolnicki**, Bartosz A. Babiarczuk, Joanna B. Warycha Fatigue crack growth under mixed-mode I + II and I + III in heat treated 42CrMo4 steel. International Journal of Fracture. 2021, s. 1-14.	**2.374**
Agnieszka Szust, Grzegorz Adamski Using thermal annealing and salt remelting to increase tensile properties of 3D FDM prints. Engineering Failure Analysis. 2022, vol. 132, art. 105932, s. 1-13.	**3.114**
Michał Biały, Sara Targońska, **Agnieszka Szust**, Rafał J. Wiglusz, Maciej Dobrzyński, In vitro fracture resistance of endodontically treated premolar teeth restored with prefabricated and custom-made fibre-reinforced composite posts. Materials. 2021, vol. 14, nr 20, art. 6214, s. 1-12.	**3.623**
Dominik Pachnicz, **Przemysław Stróżyk**. A biomechanical analysis of muscle force changes after bilateral sagittal split osteotomy. Frontiers in Physiology. 2021, vol. 12, art. 679644, s. 1-9.	**4.566**
Karolina T. Labus, Łukasz Radosiński, **Piotr Kotowski**. Functional properties of two-component hydrogel systems based on gelatin and polyvinyl alcohol - experimental studies supported by computational analysis. International Journal of Molecular Sciences. 2021, vol. 22, nr 18, art. 9909, s. 1-25.	**5.924**
Tomasz Malatyński, **Szymon Duda**, Bartosz Babiarczuk, Joanna Warycha, **Paweł Zielonka**, **Grzegorz Lesiuk**. Flexural and compressive residual strength of composite bars subjected to harsh environments. Engineering Failure Analysis. 2022, vol. 133, art. 105958, s. 1-15.	**3.114**
Szymon Duda, Grzegorz Lesiuk, Paweł J. Zielonka, Paweł Stabla, Marek Lubecki, Grzegorz J. Ziółkowski. Flexural pseudo-ductility effect in hybrid GFRP/CFRP bars under static loading conditions. Materials. 2021, vol. 14, nr 19, art. 5608, s. 1-15.	**3.623**

SELECTION OF REASEARCH CARRIED BY TEAM MEMBERS

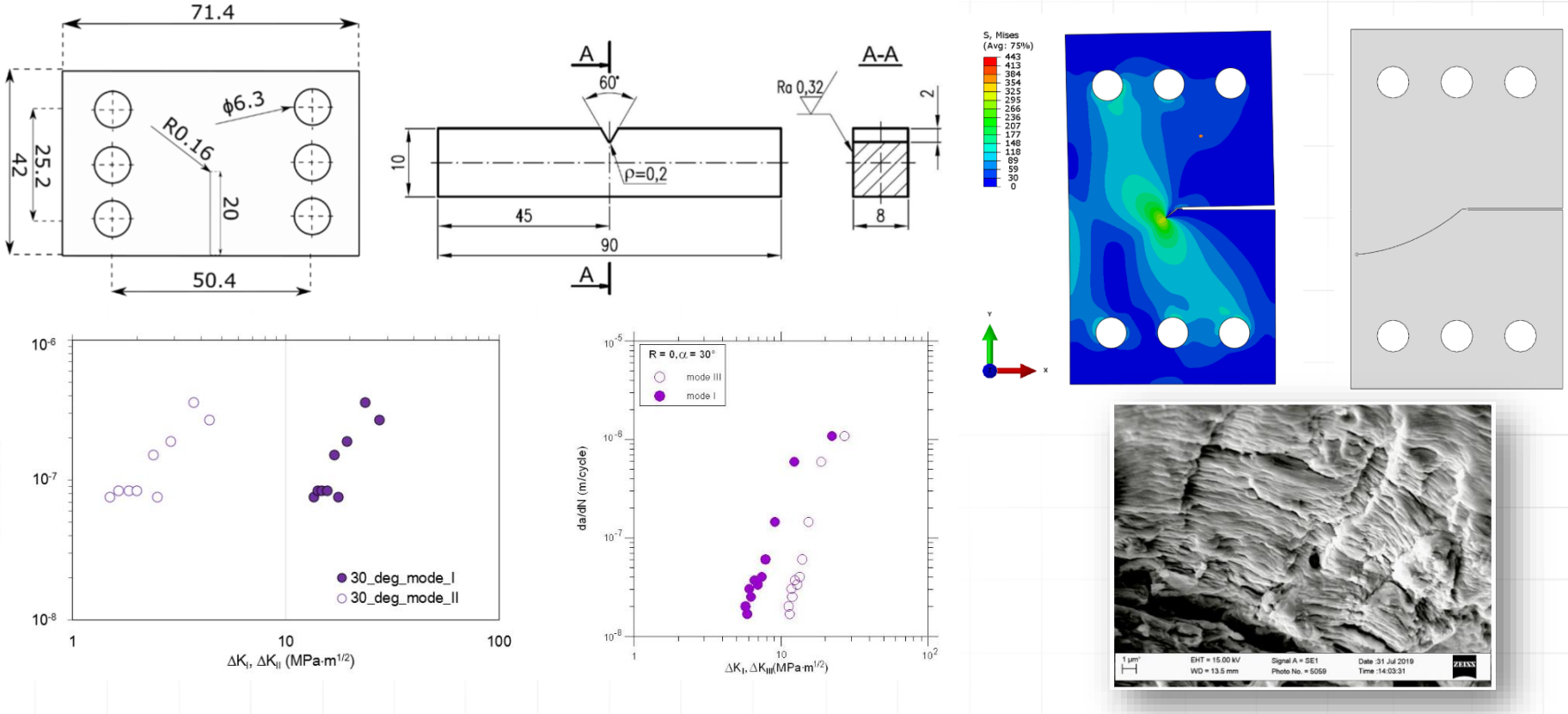
LOCAL APPROACH - IN SITU MICROCRACK ANALYSIS DURING FATIGUE FRACTURE PROCESS



Duda, M., Rozumek, D., **Lesiuk, G.**, **Smolnicki, M.** *et al.* Fatigue crack growth under mixed-mode I + II and I + III in heat treated 42CrMo4 steel. *Int J Fract* (2021). https://doi.org/10.1007/s10704-021-00585-0

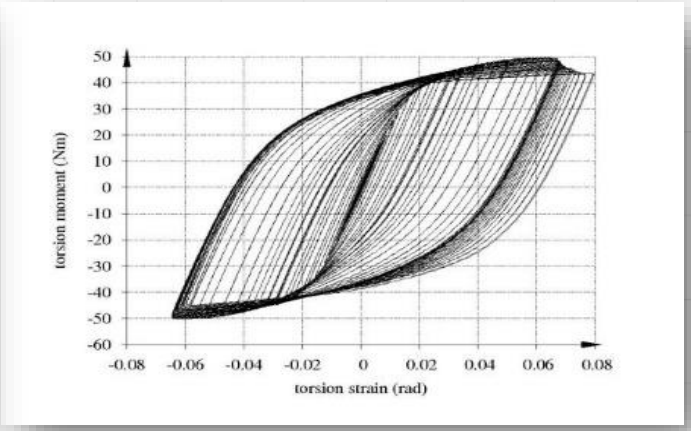


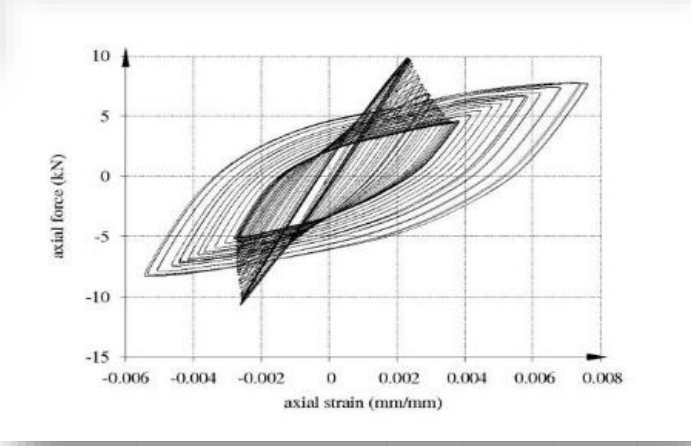
KINETICS OF CRACK GROWTH UNDER MIXED-MODE LOADING (I+II, II+III, I+III)



Lesiuk, G.; Smolnicki, M.; Rozumek, D.; Krechkovska, H.; Student, O.; Correia, J.; Mech, R.; De Jesus, A. Study of the Fatigue Crack Growth in Long-Term Operated Mild Steel under Mixed-Mode (I + II, I + III) Loading Conditions. *Materials* **2020**, *13*, 160. https://doi.org/10.3390/ma13010160

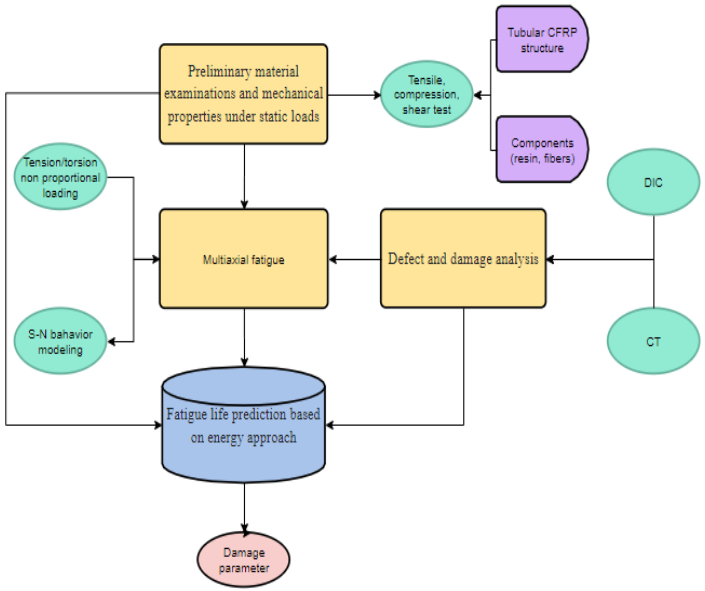
MULTIAXIAL FATIGUE AND DAMAGE MODELING





Rita Dantas, José Correia, **Grzegorz Lesiuk**, Dariusz Rozumek, Shun-Peng Zhu, Abílio de Jesus, Luca Susmel, Filippo Berto, Evaluation of multiaxial high-cycle fatigue criteria under proportional loading for S355 steel, Engineering Failure Analysis, 120, 2021, https://doi.org/10.1016/j.engfailanal.2020.105037.

FATIGUE OF COMPOSITE MATERIALS

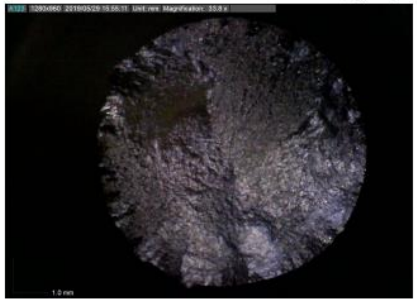


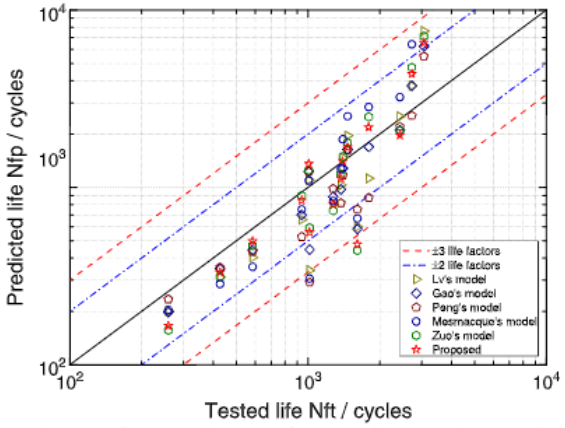
This research concerns the investigation of multiaxial fatigue behavior and fatigue life assessment of carbon fiber reinforced polymer (CFRP) under non-proportional loading conditions. The main objective of the research is the characterization of multiaxial behavior in terms of parameters such as non-proportionality (phase shifting), biaxiality ratio, and variable amplitude (various stress ratios).

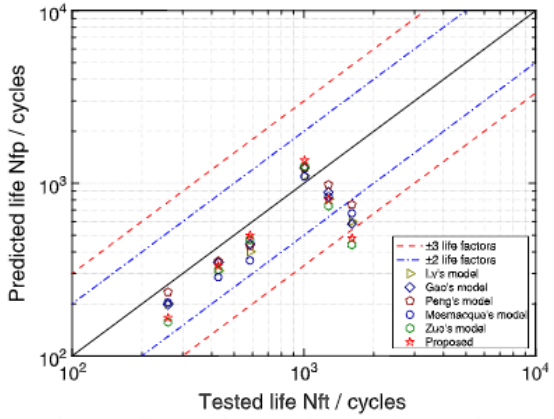
MULTIAXIAL FATIGUE AND NONLINEAR DAMAGE ACCUMULATION HYPOTHESIS

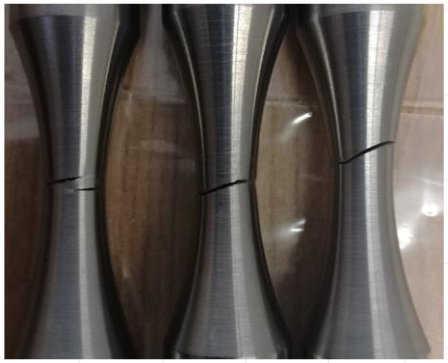
$$\frac{n_i}{N_{fi}} = \left(1 - \frac{n_1}{N_{f1}} - \frac{n_2}{N_{f2}} - \cdots - \frac{n_{i-1}}{N_{fi-1}}\right)\left(\frac{\ln N_{f1}}{\ln N_{fi}}\right)^{\frac{\sigma_{i-1}}{\sigma_i}}.$$

(a) Specimen 15 (b) Specimen 16



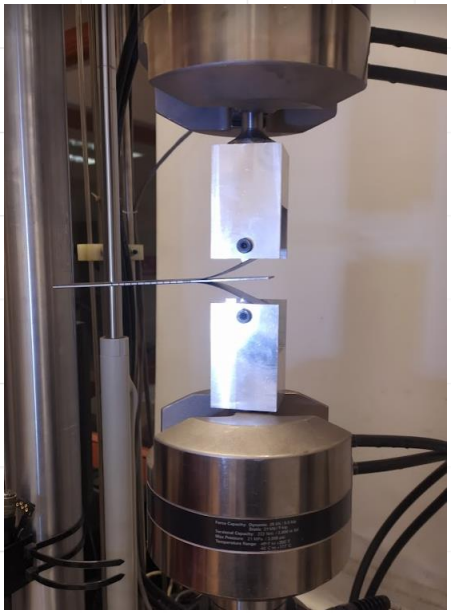


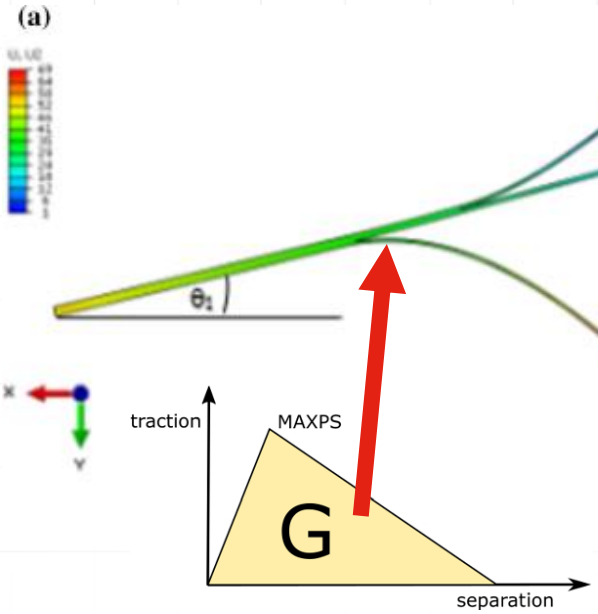


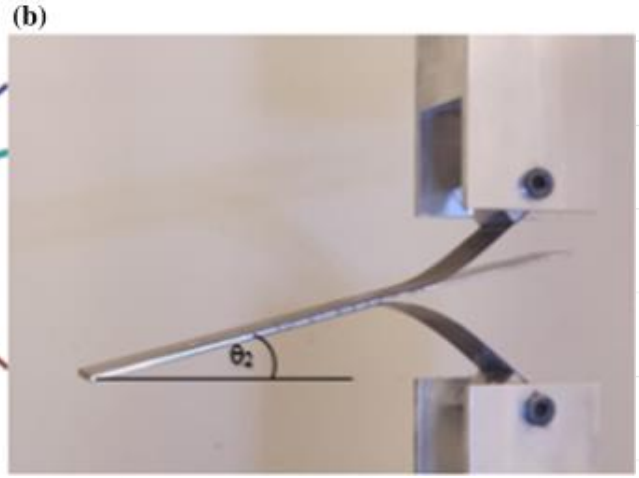


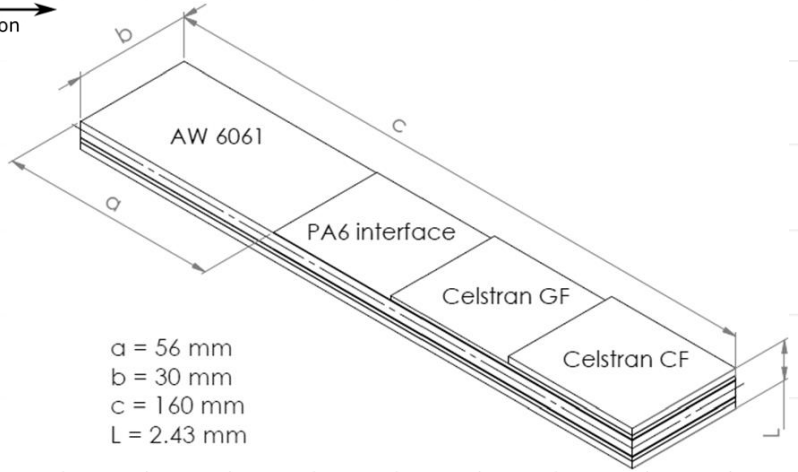
Zhu, SP, Hao, YZ, de Oliveira Correia, JAF, **Lesiuk, G**, de Jesus, AMP. Nonlinear fatigue damage accumulation and life prediction of metals: A comparative study. *Fatigue Fract Eng Mater Struct*. 2019; 42: 1271– 1282. https://doi.org/10.1111/ffe.12937

FRACTURE MECHANIC OF COMPOSITES



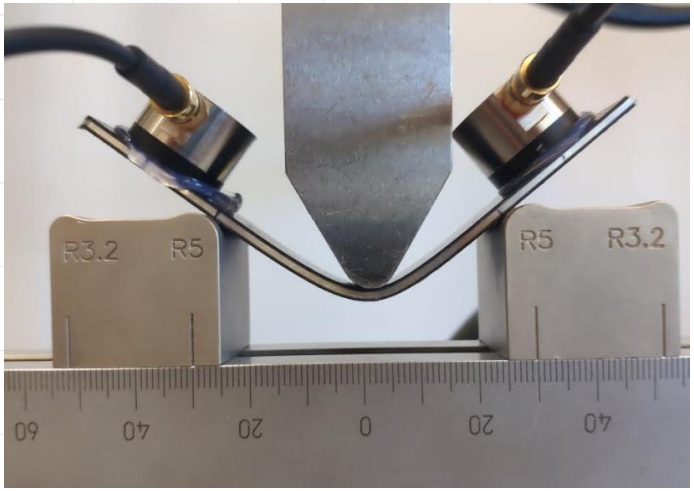


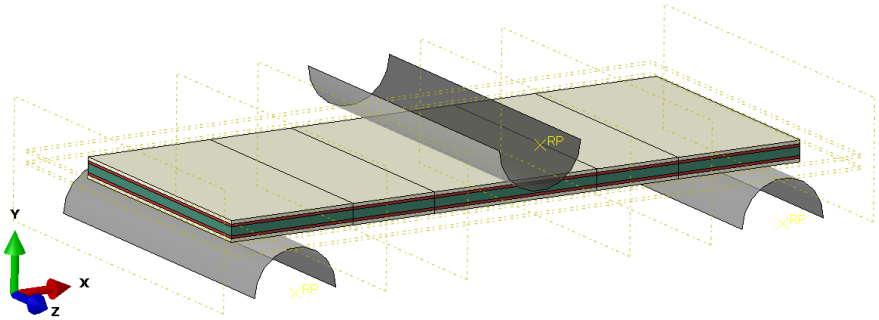


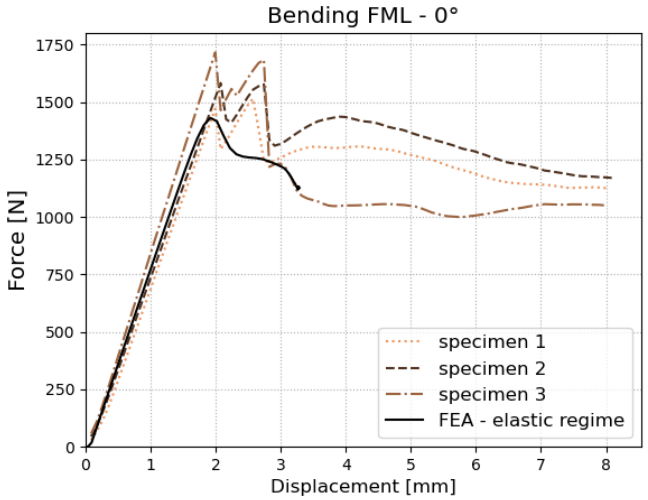


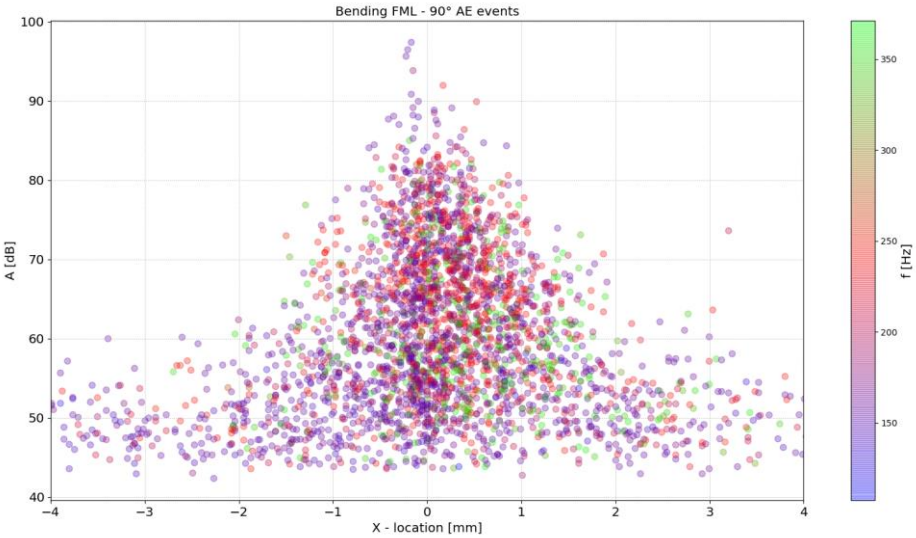
Duda, S., Smolnicki, M., Osiecki, T., **Lesiuk, G.** Determination of fracture energy (mode I) in the inverse fiber metal laminates using experimental–numerical approach. *Int J Fract* (2021). https://doi.org/10.1007/s10704-021-00566-3

FIBER METAL LAMINATES EXPERIMENTAL AND NUMERICAL APPROACH + ACOUSTIC EMISION

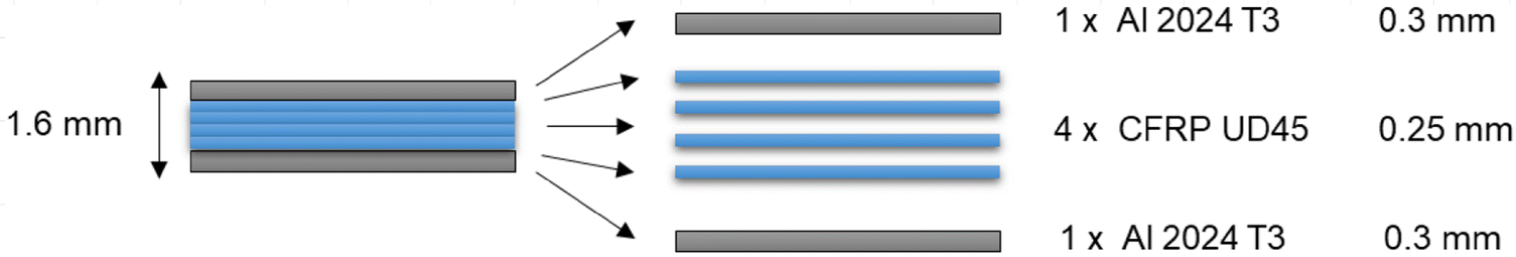


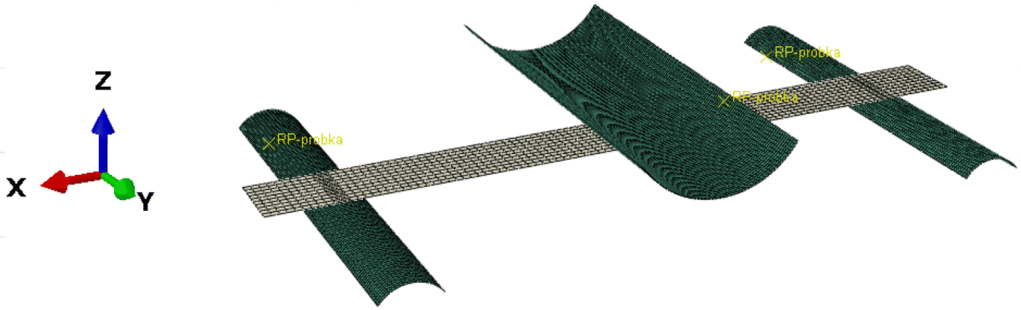




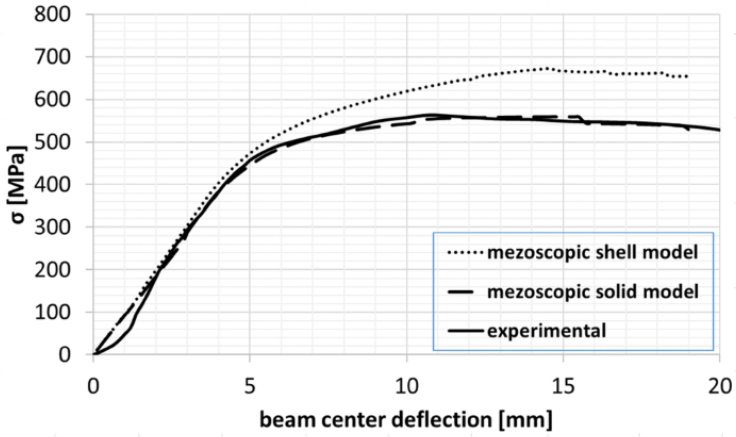


FIBER METAL LAMINATES TESTING

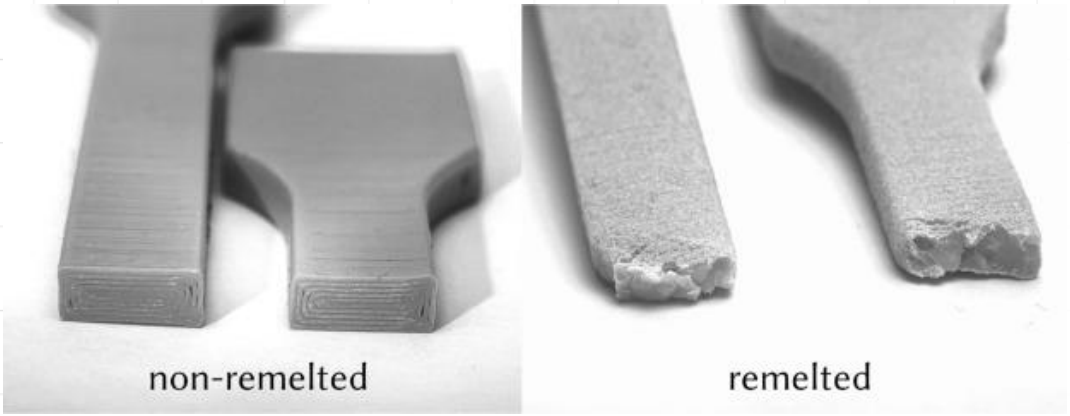


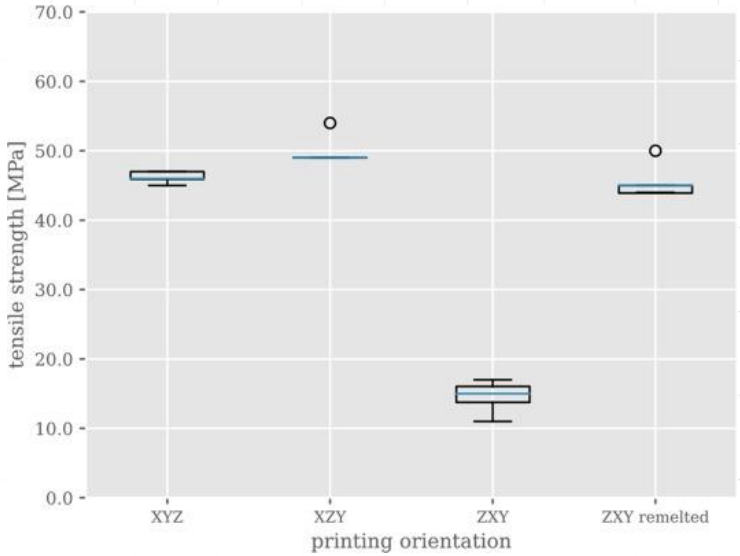


Smolnicki, M., Stabla, P. Finite element method analysis of fibre-metal laminates considering different approaches to material model. *SN Appl. Sci.* **1,** 467 (2019). https://doi.org/10.1007/s42452-019-0496-2



TESTING STRENGTH PROPERTIES OF ADDITIVE MANUFACTURED MATERIALS

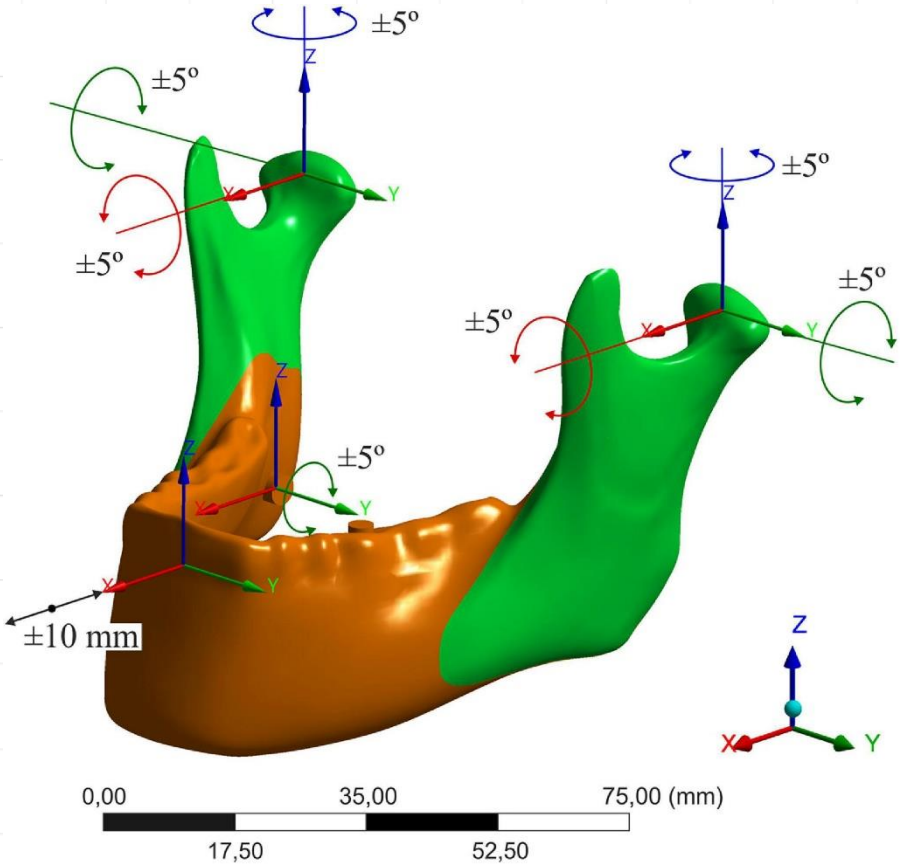


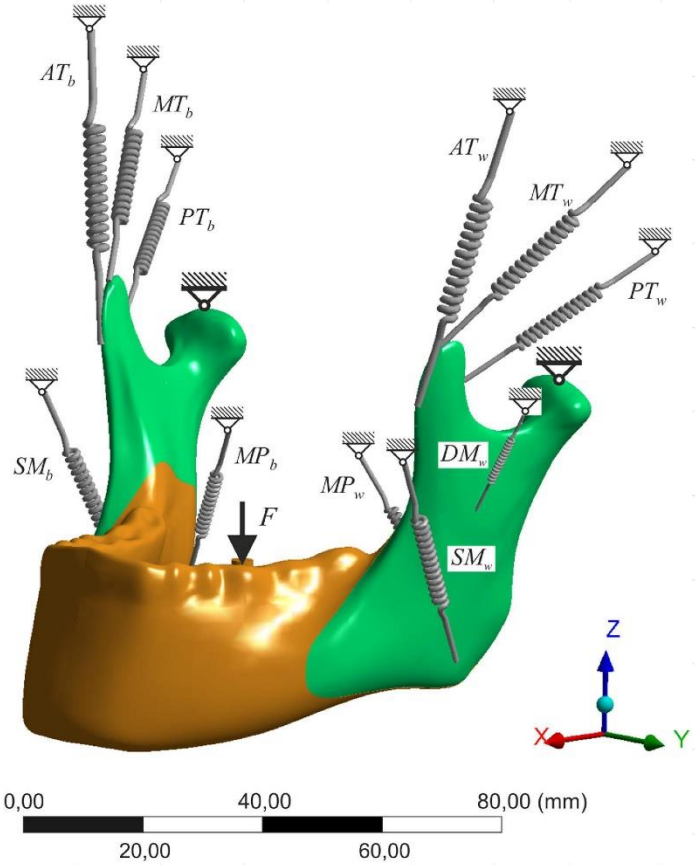


The effect of printing orientation and salt remelting process on tensile strength of PETg FDM specimens.

Agnieszka Szust, Grzegorz Adamski, Using thermal annealing and salt remelting to increase tensile properties of 3D FDM prints, Engineering Failure Analysis,132, 2022, https://doi.org/10.1016/j.engfailanal.2021.105932.

BIOMECHANICAL ANALYSIS OF LOWER JAW – EXPERIMENTAL AND NUMERICAL





Pachnicz D and **Stróżyk P** (2021) A Biomechanical Analysis of Muscle Force Changes After Bilateral Sagittal Split Osteotomy. *Front. Physiol.* 12:679644. doi: 10.3389/fphys.2021.679644

BIOMATERIALS – SELECTED FRACTURE ANALYSIS

FRACTURE TOUGHNESS OF PEEK composite

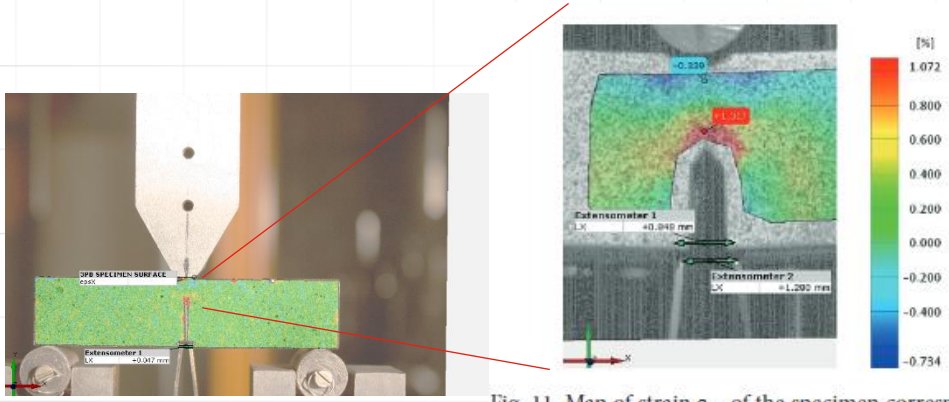
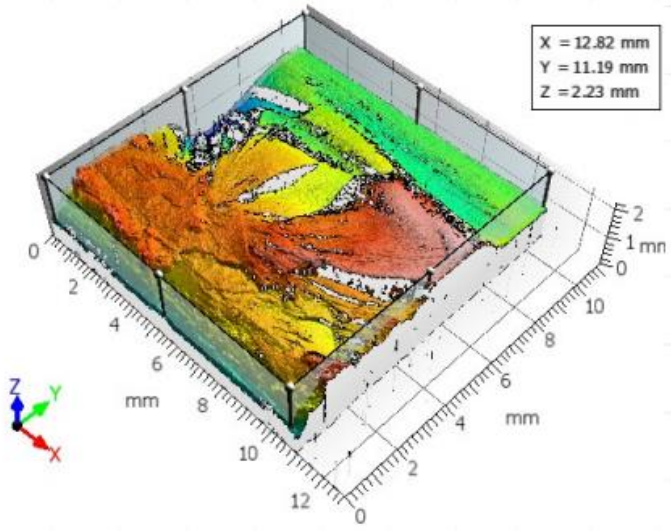
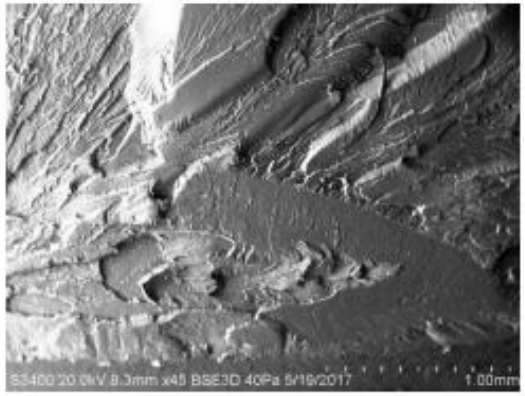
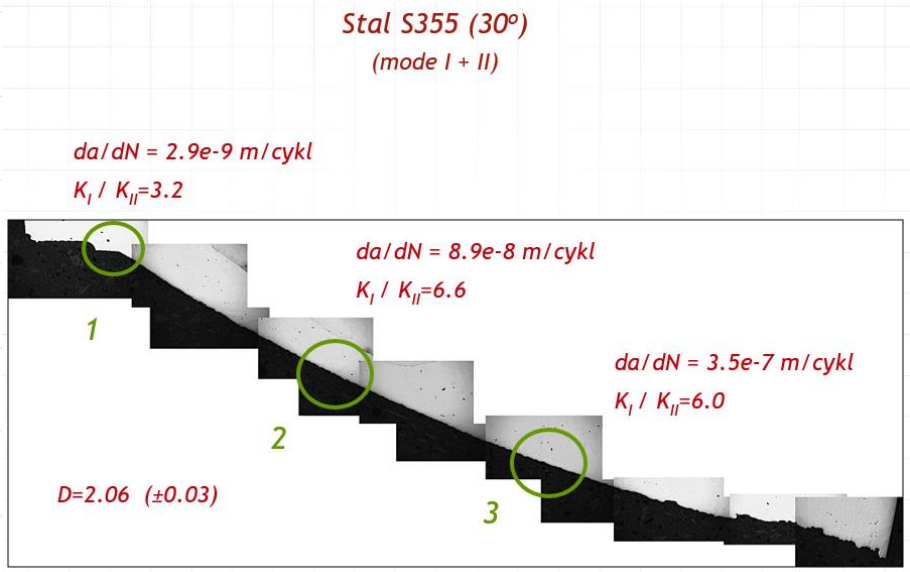


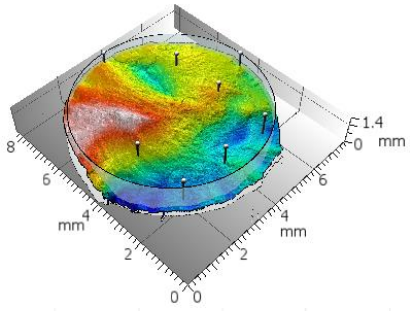
Fig. 11. Map of strain ε_{xx} of the specimen corresponding to the force value equal to $P_Q = 850$ N

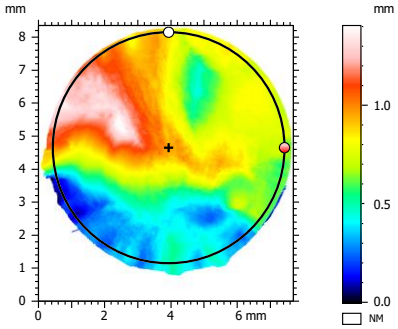


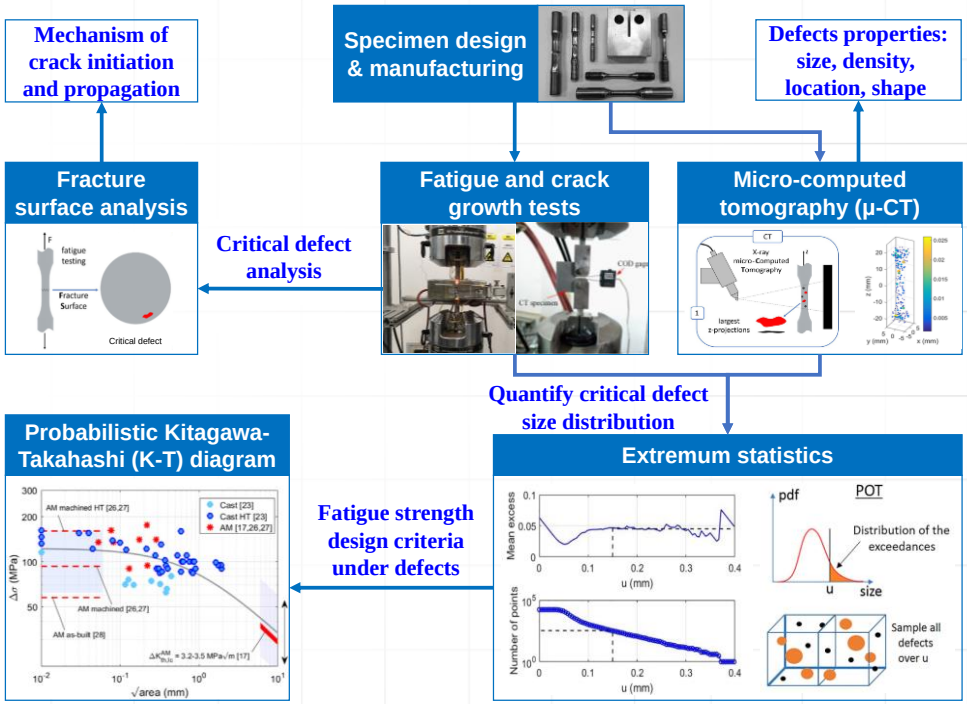


FRACTURE MORPHOLOGY – FRACTAL GEOEMETRY – DEFECTS MODELING



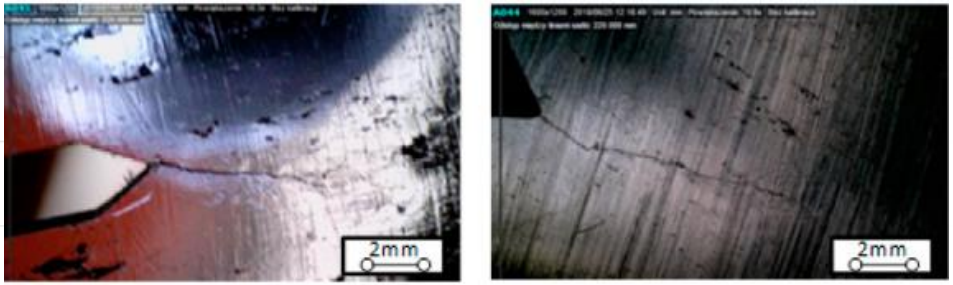




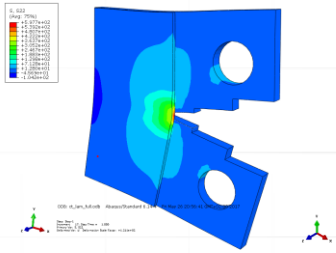


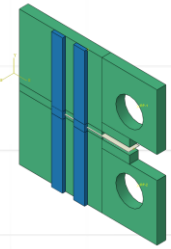
PhD Eng. Piotr Kotowski

FATIGUE AND FRACTURE OF MATERIALS USED IN CIVIL ENGINEERING - BRIDGES AND REINFORCED STEEL STRUCTURES WITH CFRP STRIPS



(a) (b)



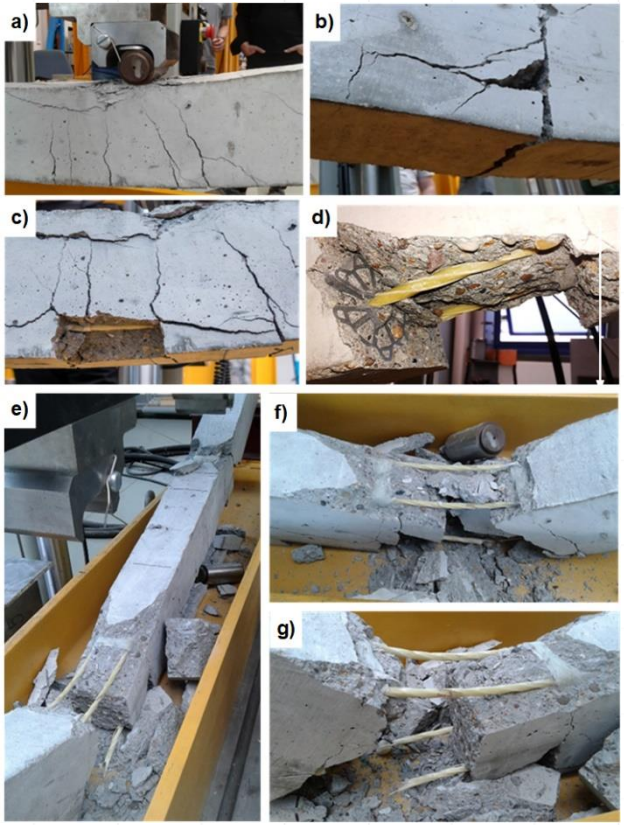


a)

b)

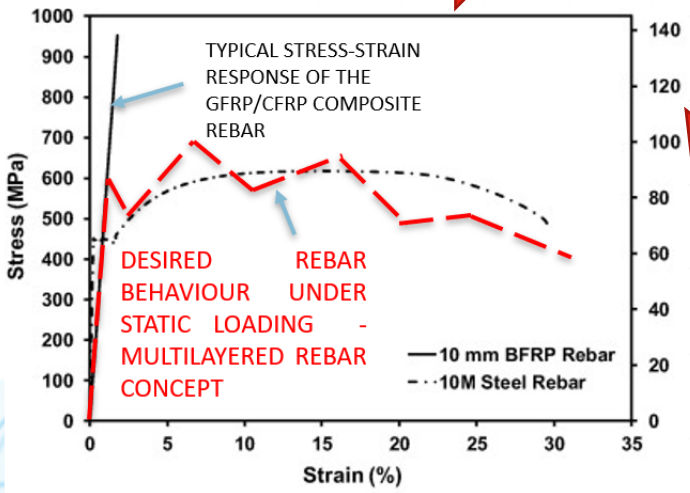
Pedrosa, B., Correia, JAFO, Rebelo C., **Lesiuk G**., Jesus A., Fernandes A., **Duda M**., et. al.. Fatigue resistance curves for single and double shear riveted joints from old portuguese metallic bridges, Engineering Failure Analysis, 96, 2019, 255-273, https://doi.org/10.1016/j.engfailanal.2018.10.009.

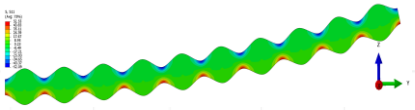
DESIGN OF REBARS AND ANCHORAGING SYSTEM – project: hybrid rebars (leader WUST – PhD. DSc. Eng. Grzegorz Lesiuk, budget approx: 330 kEUR) - PRE-ELIMINARY STUDY OF THE EXISTING SOLUTIONS

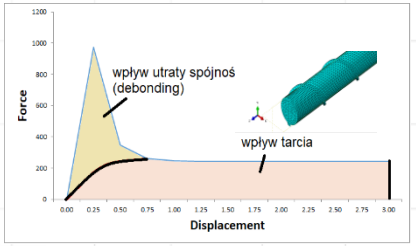


PROBLEM

MANUFACTURING OPTIMIZATION – NEW DESIGN OF COMPOSITE REBARS SOLUTIONS:

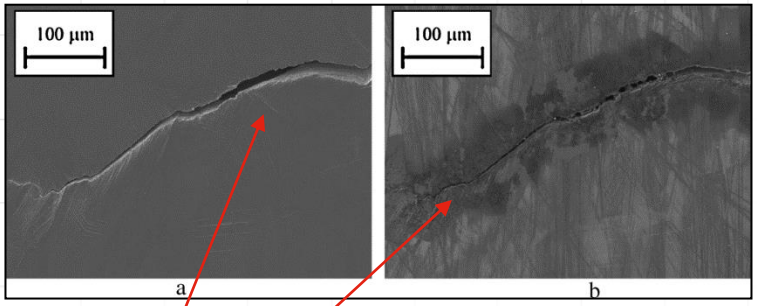


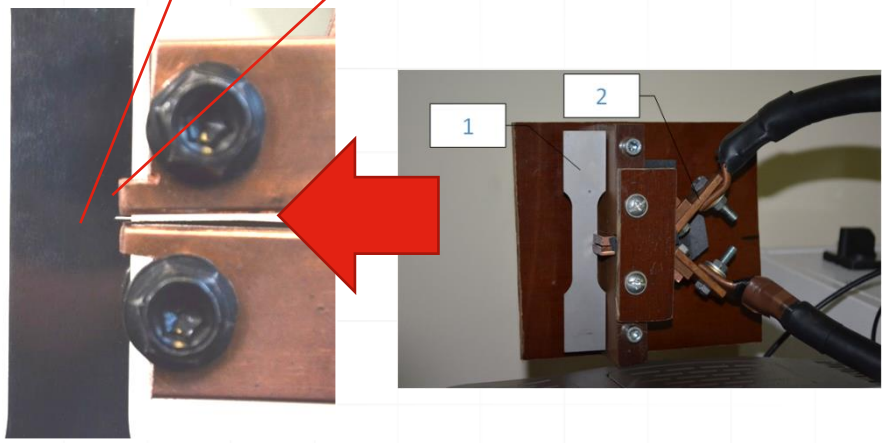


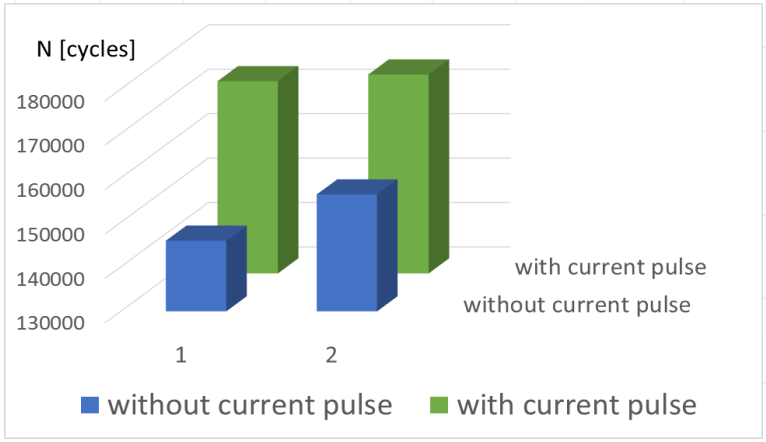


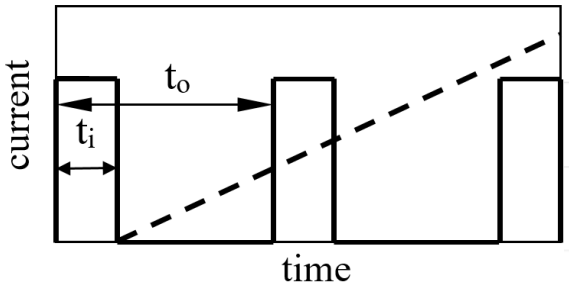
Stroński, P., Błażejewski, W., Socha, T., Denisiewicz, A., Kula, K., **Lesiuk, G.,** & Correia, J. A. F. O. (2020). Influence of reinforcement Type on Flexural Behaviour of Reinforced Concrete Beams. Proceedings of the Institution of Civil Engineers - Forensic Engineering, 1–9. doi:10.1680/jfoen.20.00009

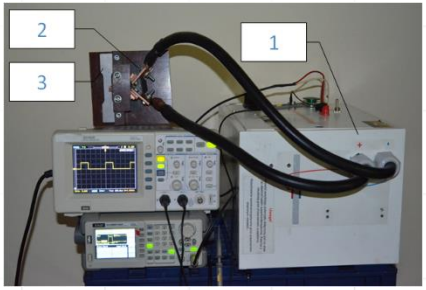
CRACK „HEALING” – ELECTROPLASTICITY PHENOMENON – ELECTRO-MECHANICAL EFFECT





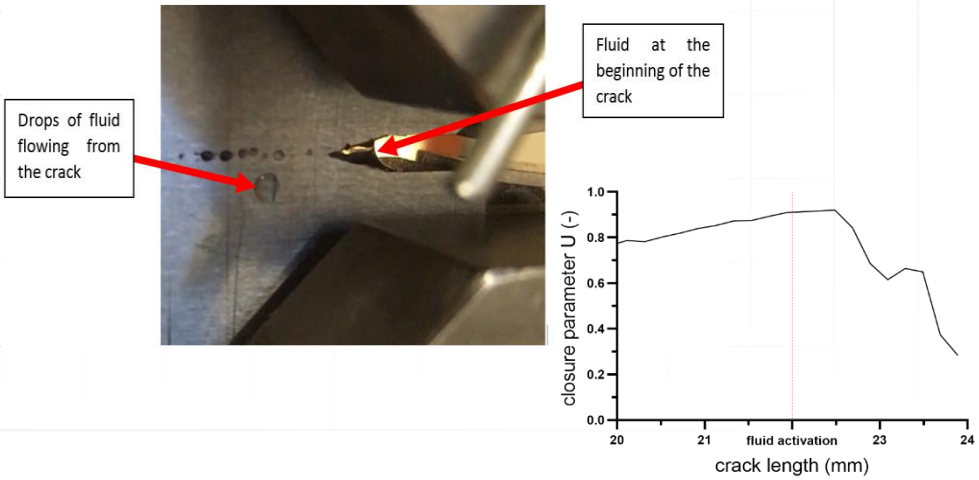


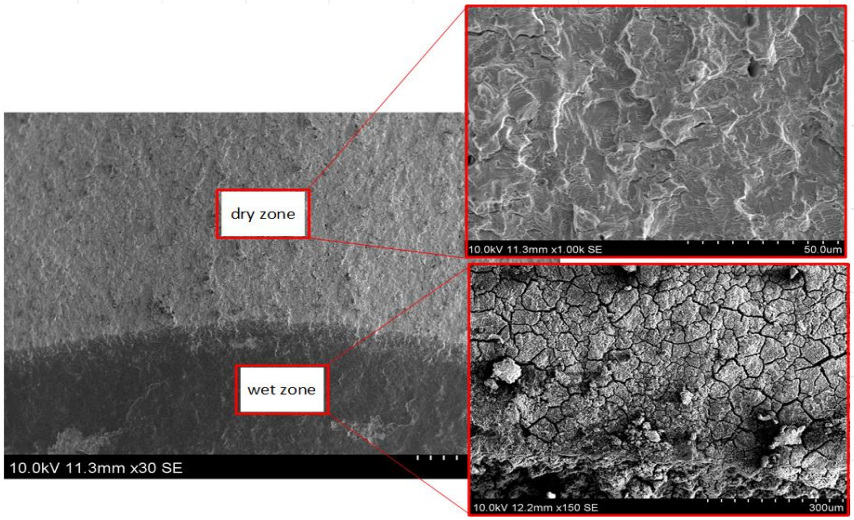


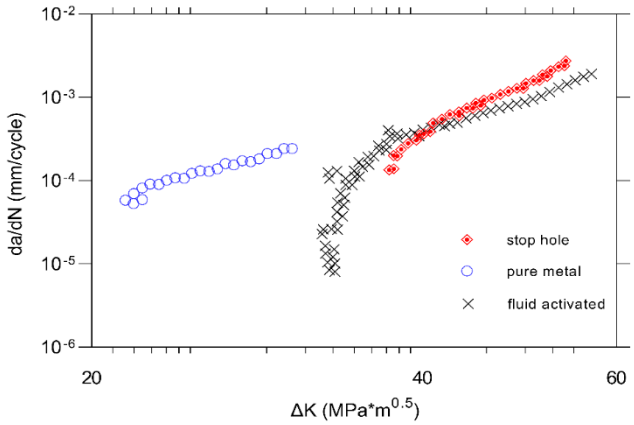


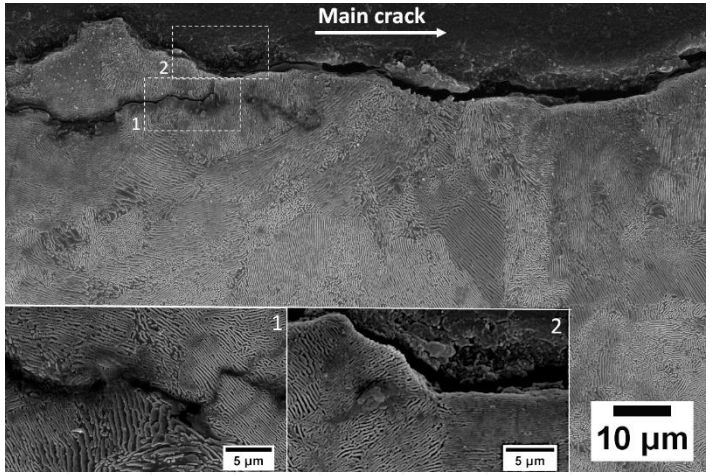
Z. Zimniak**, G. Lesiuk**, and W. Wiśniewski, “Supercapacitors electropulsing method for improvement the fatigue resistance of the austenitic steel sheets”, *Weld. Tech. Rev.*, vol. 90, no. 2, Feb. 2018.

ARTIFICIAL CRACK CLOSURE MECHANISM – COOPERATION WITH PROF. NYKYFORCHYN, MICROSTRUCTURAL ASPECTS – RAIL STEEL

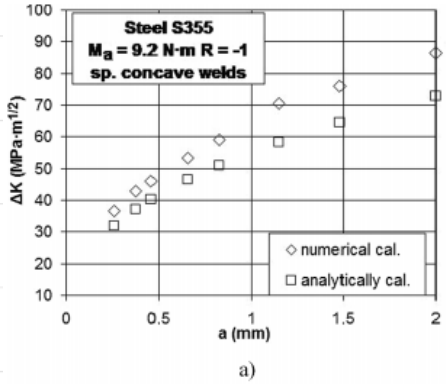




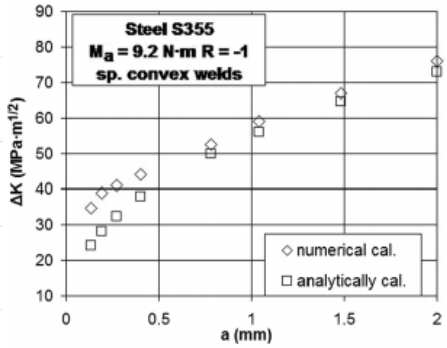


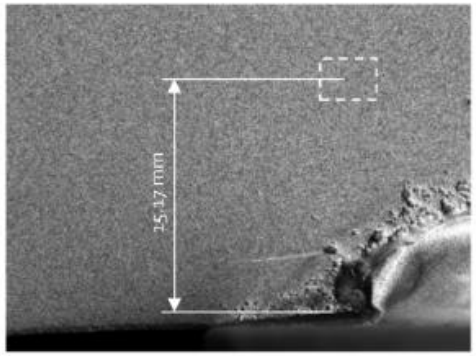


CRACK GROWTH ANALYSIS IN WELDED JOINTS

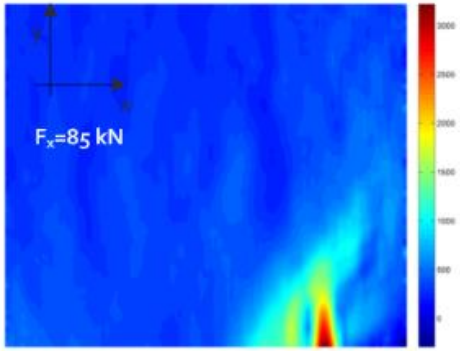


a)

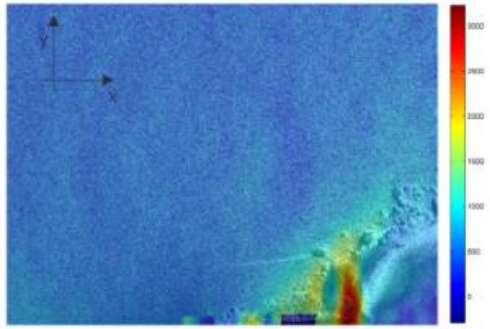


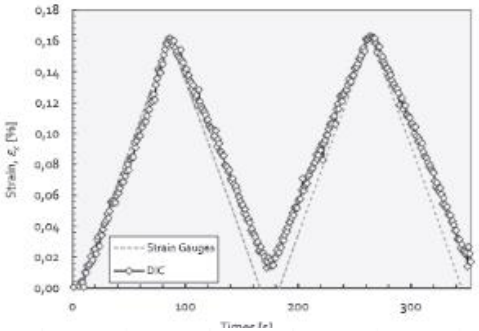


a)



b)



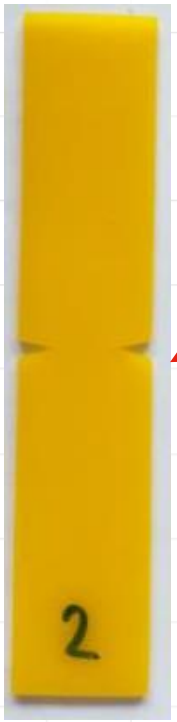


Dariusz Rozumek, Janusz Lewandowski, **Grzegorz Lesiuk**, José A. Correia, The influence of heat treatment on the behavior of fatigue crack growth in welded joints made of S355 under bending loading, International Journal of Fatigue,131, 2020, 105328, https://doi.org/10.1016/j.ijfatigue.2019.105328

António L.L. da Silva, José A.F.O. Correia, Abílio M.P. de Jesus, **Grzegorz Lesiuk**, António A. Fernandes, Rui Calçada, Filippo Berto, Influence of fillet end geometry on fatigue behaviour of welded joints, International Journal of Fatigue, 123, 2019, https://doi.org/10.1016/j.ijfatigue.2019.02.025.

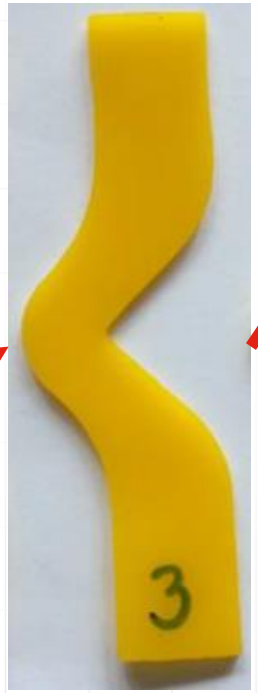
POLYURETHANE ELASTOMERS – STATIC TESTS

ASTM D412 – tensile test



EWF-test (notch-razor sharpened crack like defect)

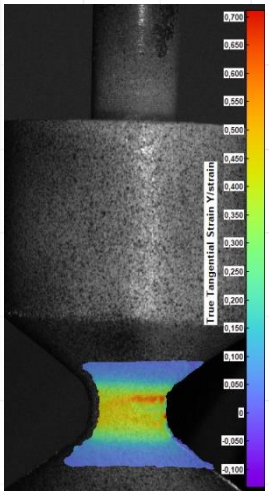
ASTM D624 – tear resistance test

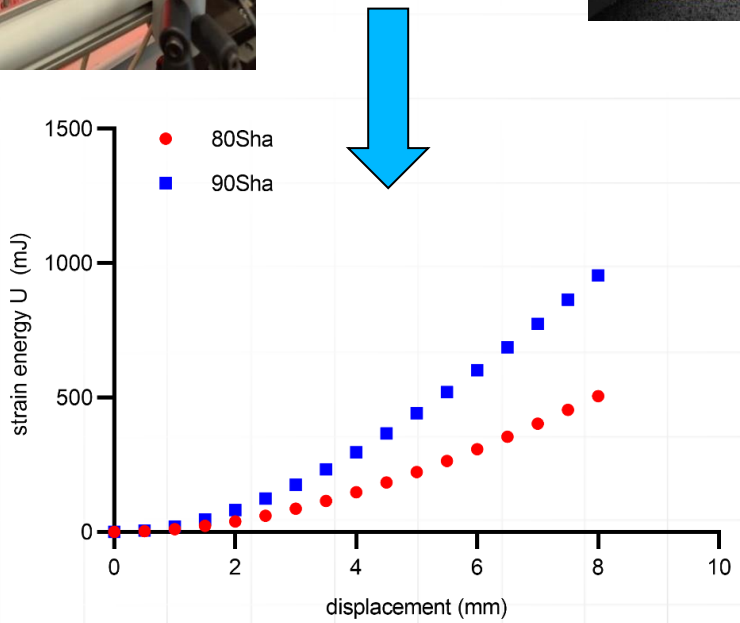


Property	PUR80ShA	PUR90ShA
Ultimate Tensile Strength σ_{UTS} (MPa)	31.8	**41.8**
Critical strain at rupture ε_u (%)	419	**422**
Tear Resistance T (N/mm)	93.7	**134.0**
$\sigma_{100\%}$ (MPa)	3.7	**7.4**
$\sigma_{200\%}$ (MPa)	5.4	**11.1**
$\sigma_{300\%}$ (MPa)	**7.0**	**15.1**

POLYURETHANE ELASTOMERS – FATIGUE + DIC

Force DIC = 465 N,
FEM Force = 468 N





SELECTED (INTER)NATIONAL COOPERATION

1. **University of Porto (PT)** – prof. Abilio M.P. De Jesus (fatigue & fracture mathematical and numerical modeling), prof. Rui Calcada (structural integrity of civil engineering structures)
2. **University of Coimbra (PT)** prof. Carlos Rebelo (fatgigue crack growth rate description in long term operated structures)
3. **University of Oviedo (ESP)** – prof. Fernandez Canteli – probabilistic approach in fatigue
4. **Norwegian University of Science and Technology, Trondheim (NO)** – prof. Filippo Berto – numerical modeling of cohezive zone with theory of critical distances
5. **University of Electronic Science and Technology of China, Chengdu (CN)** – prof. Shun Peng-Zhu – multiaxial fatigue
6. **University of Waterloo (CA)** – prof. Grzegorz Glinka – crack growth modeling in welded structures
7. **Opole University of Technology -** prof. Dariusz Rozumek – mixed-mode fatigue crack growth and multiaxial fatigue models
8. **University of Zielona Góra (PL)**– Dr Tomasz Socha, Dr Arkadiusz Denisiewicz – hybrid lightweight structuers modeling for civil engineering applications
9. ***Institute of Lightweight Structures, Chemnitz University of Technology, Cheminitz (GER), prof. Lothar Kroll*** *- polymers, composite mechanical damage modeling*
10. **Ukrainian Academy of Science, Physico-Mechanical Institute – Karpenko, Lviv (UKR)** – prof. Nykyforchyn, prof. Zvirko, prof. Student, dr Krechkovska - material degradation modeling

SELECTED INTERNATIONAL COOPERATION

11. **University M'Hamed Bougara of Boumerdes**, **Algieria –** prof. Mohamed El. Amine Ben Seghier, pipelines reliability modeling with Monte Carlo approach and M5 trees
12. **University of Brest (FR**), Prof. Stephane Sire – structural integrity analysis of the long term operated railway structures
13. **Czech Academy of Sciences**, Institue of Physics of Materials (CZ), prof. Stanislav Seitl – modeling of the stress fields and multiaxial fatigue under random loads, additive manufacturing fatigue analysis
14. **University of Delft (NL)** – prof. Milan Veljkovic (numerical analtsis of the riveted joints)
15. **University of Bologna (IT**) – prof. Cristiano Fragassa, prof. Ana Pavlovic (new technologies of the composite manufacturing and neural network analysis of the damage process)
16. **University of Minas Gerais (UMFG), Brazil (BR)** – prof. Hermes Carvalho, fracture mechanics approach in concrete structures, damage modeling
17. **Universititi Teknologi PETRONAS, Malaysia (MY) –** Mohammad Azeem, composites, filament winding technology

U.PORTO

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OPOLE UNIVERSITY OF TECHNOLOGY

TECHNISCHE UNIVERSITÄT CHEMNITZ

ipm

UNIVERSITI TEKNOLOGI PETRONAS

ORGANIZATIONS

PGMP Polish Group of Fracture Mechanics

CHAIRMAN of PGMP
PhD. DSc. Eng.
Grzegorz Lesiuk,
Associate Professor

ptmts Polish Society of Theoretical and applied Mechanics

ESIS European Structural Integrity Society

European Structural Integrity Society

INDUSTIAL COOPERATION

PROTO
X-RAY DIFFRACTION

PBW
INŻYNIERIA

Nobo
solutions

JOHN DEERE

STRONGFLEX
POLYURETHANE COMPONENTS

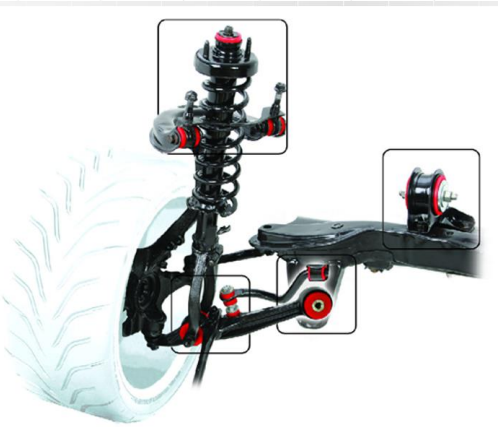
DOLKOM
WROCŁAW

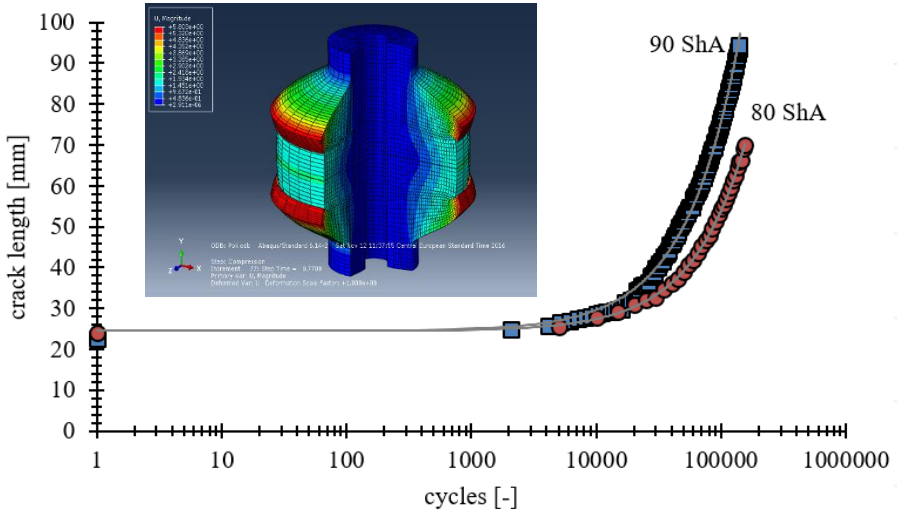
probudowa.com

AUTOMOTIVE APPLICATIONS - FATIGUE AND FATIGUE CRACK GROWTH IN POLYURETHANE COMPONENTS COMMONLY USED IN SUSPENSION SYSTEM

a)

b)





K. Junik, G. Lesiuk, M. Barcikowski, W. Błażejewski, A. Niemiec, M. Grobelny, K. Otczyk, J.A.F.O. Correia, Impact of the hardness on the selected mechanical properties of rigid polyurethane elastomers commonly used in suspension systems, Engineering Failure Analysis,121, 2021, https://doi.org/10.1016/j.engfailanal.2020.105201.

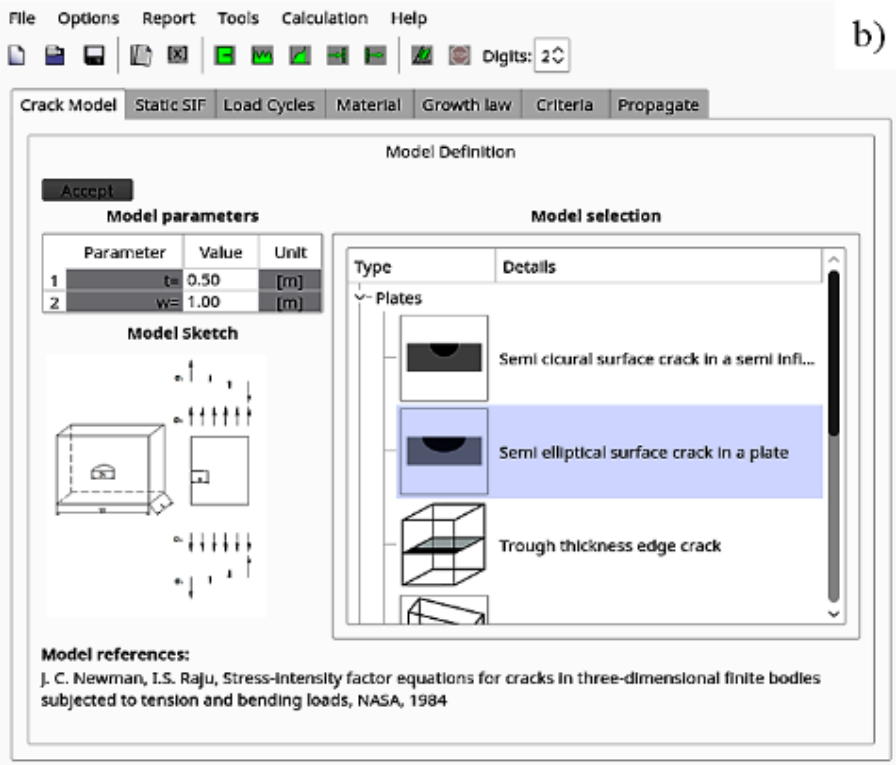
STRONGFLEX POLYURETHANE COMPONENTS

Wrocław University of Science and Technology

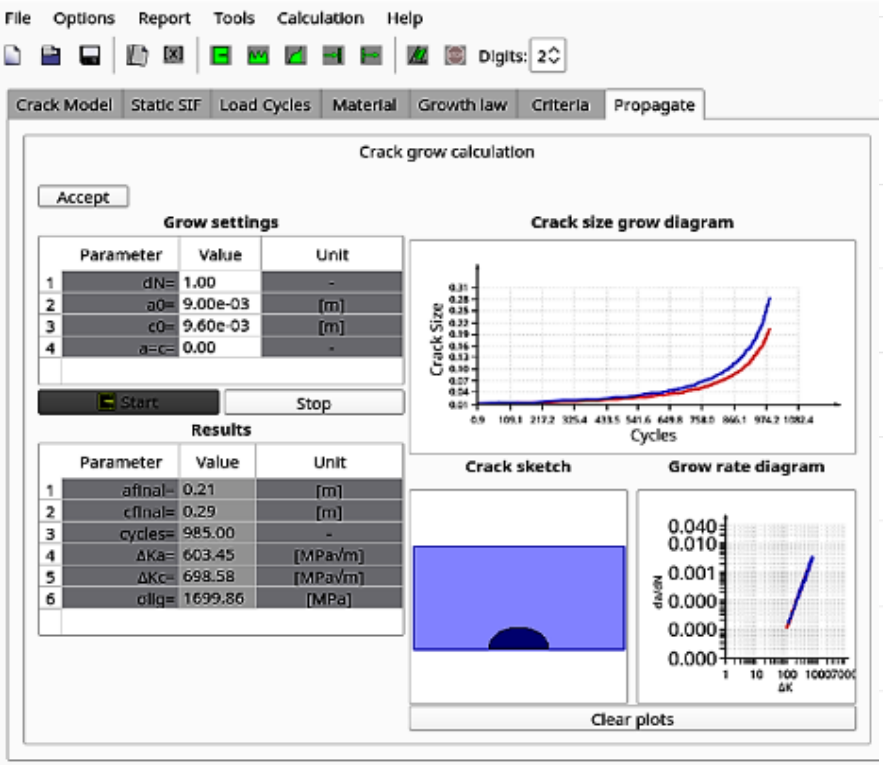
ENGINEERING SOFTWARE DEVELOPMENT SUPPORT – IT TOOLS FOR FRACTURE MECHANICS

COOPERATION WITH NOBO SOLUTIONS S.A. – FM TOOL/FMPIPE – FATIGUE CALCULATOR FOR CRACKED COMPONENTS

a)



b)



Nobo solutions

Wrocław University of Science and Technology

CHOICE OF CURRENT PROJECTS WITH TEAM MEMBERS AS PRINCIPAL INVESTIGATORS

1. **NCBIR – LIDERX 0219/L-10/2018)** *„New generation of composite rebars and anchoraging systems„ - PI PhD. DSc. Eng. Assoc. Prof. Grzegorz Lesiuk – 1.498.400 zł (30 months 2019/2020-2023)*

2. **NCN – PRELUDIUM 2018/31/N/ST8/03590** (2019/07/12-2021/07/11) *Fatigue crack closure analysis under multiaxial loading conditions in terms of energy approach* – 139 800 zł – PI: MSc. Eng. Monika Duda, PhD. DSc. Eng. Assoc. Prof. Grzegorz Lesiuk

3. **NCN (PRELUDIUM) 2021/41/N/ST8/03365** - Fatigue behavior and life assessment of CFRP structures under global non-proportional multiaxial loading conditions – MSc. Eng. Szymon Duda

4. **NAWA – PPN/BUA/2019/1/00086** (2020-2022) *Interfacial strength examination of new hybrid composite materials using fracture mechanics approach: Polska - Politechnika Wrocławska (PhD. DSc. Eng. Assoc. Prof. Grzegorz Lesiuk), Ukraina – Physico-Mechanical Karpenko Institute, Lviv, (prof. Olha Zvirko)*

CHOICE OF PROJECTS WITH TEAM MEMBERS AS CO-INVESTIGATORS

1. **NCN – OPUS LAP - 2020/39/I/ST5/03493** (2022-2025) Research on the influence of self-healing, organic-inorganic sol-gel layers on the corrosion resistance and fatigue of steel in the VHCF range, PI: Dr Justyna Krzak

OPUS 20 + LAP

2. **NCBiR: MAZOWSZE/0141/19** - Opracowanie inteligentnej konstrukcji ciśnieniowego zbiornika kompozytowego z uchylną dennicą. [INNOTANK] (PhD. DSc. Eng. Grzegorz Lesiuk, MSc Eng. Michał Smolnicki)

Narodowe Centrum Badań i Rozwoju

3. **FiberBridge - 02/SAICT/2017 / PT2020** Fatigue strengthening and assessment of railway metallic bridges using fiber-reinforced polymers, 3 years (2018-2021) - leader: University of Porto – Investigator: PhD. DSc. Eng. Grzegorz Lesiuk

4. **NAWA – BPN/BPT/2021/1/00059** Ocena integralności strukturalnej rusztowań obciążonych biologicznie stosowanych w regeneracji układu stomatognatycznego (PhD. DSc. Eng. Grzegorz Lesiuk, PhD Eng. Przemysław Stróżyk, PhD Eng. Agnieszka Szust)

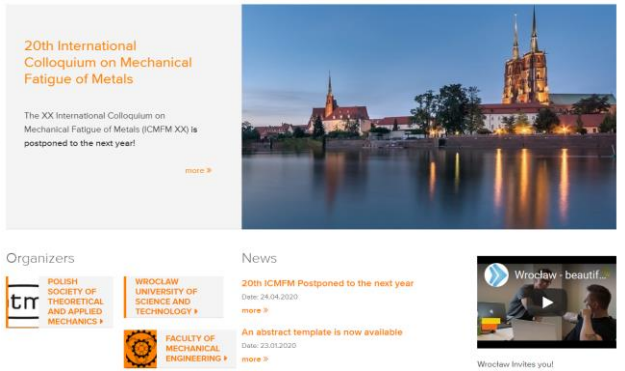
NAWA
NARODOWA AGENCJA WYMIANY AKADEMICKIEJ

RECENT ORGANIZING ACTIVITY (2020-2021)

VCMF 2020
Virtual Conference on Mechanical Fatigue

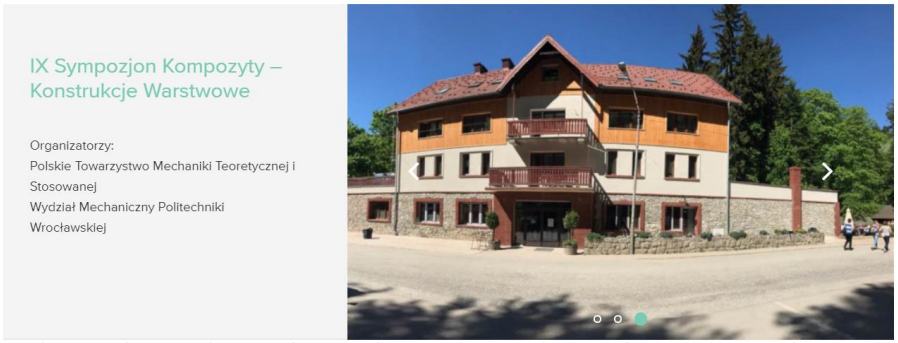
www.vcmf.eu

20th International Colloquium on Mechanical Fatigue of Metals



www.icmfmxx.pwr.edu.pl

IX Sympozjon Kompozyty – Konstrukcje Warstwowe



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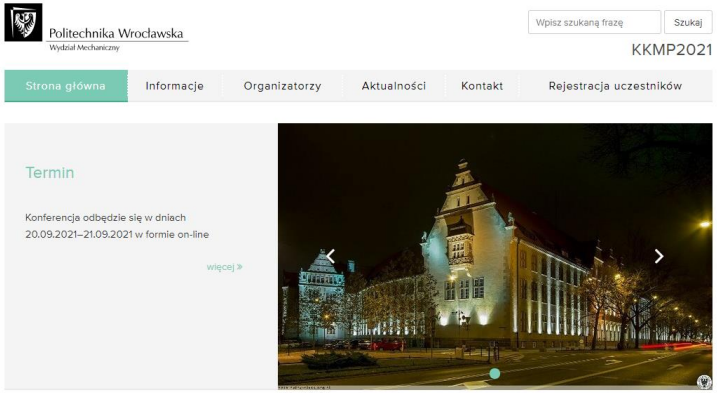
Krajowa Konferencja Mechaniki Pękania 2021



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INCOMING ORGANIZED EVENTS

XIX Krajowa Konferencja Mechaniki Pękania 2023

More details will be announced soon.