



UNIVERSITY
OF LATVIA



Uzlaboto biomateriālu un biofizikas laboratorija

Dr. Maksym Pogorielov, MD

27.02.2025

Our Team



Full time employees

Maksym Pogorielov

Viktoriiia Korniienko

Volodymyr Deineka

Kateryna Diedkova

Elza Gārša

Arvids Borovskis

Pavlo Shubin

Part time employees

Mārtiņš Borodušķis

Aleksejs Ļihačovs

Lita Grīne

Marks Truhins

Baiba Zandersone

Anastasiia Haidai

Disha Arora

Ena Enija Gavare

Evelina Bebre

Vanesa Varnonska

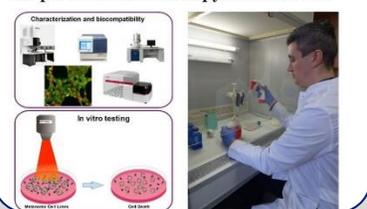
Projects

Horizon Europe



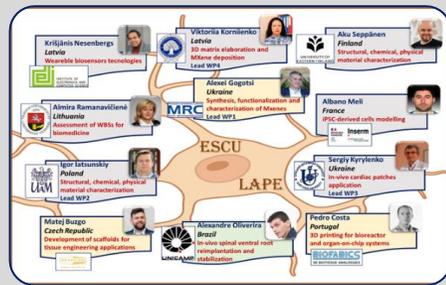
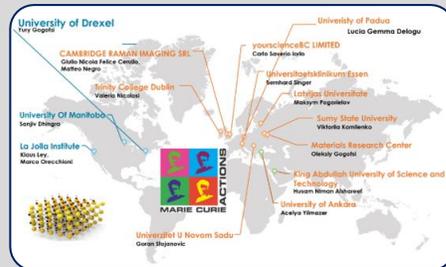
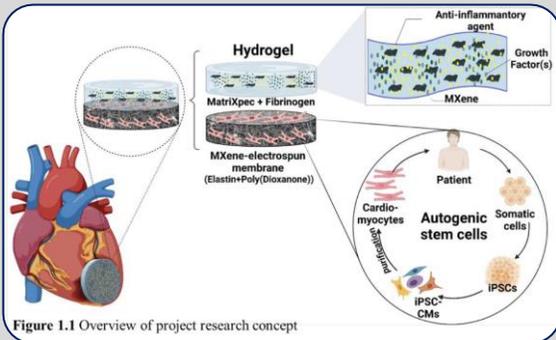
MSCA 4 UKRAINE

Innovative two-dimensional nanomaterials for photo-thermal therapy of melanoma

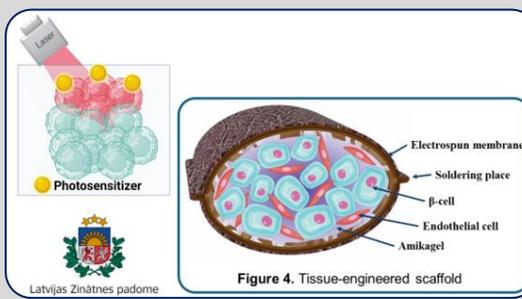
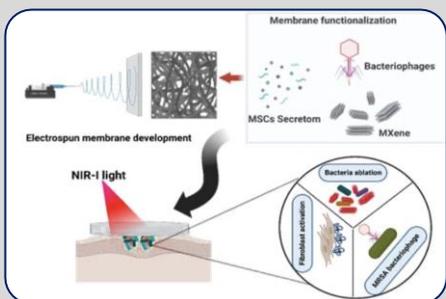
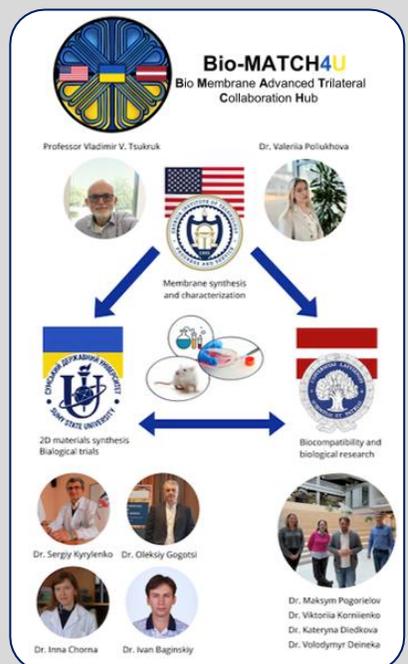


Characterization and biocompatibility
In vitro testing

PostDoc



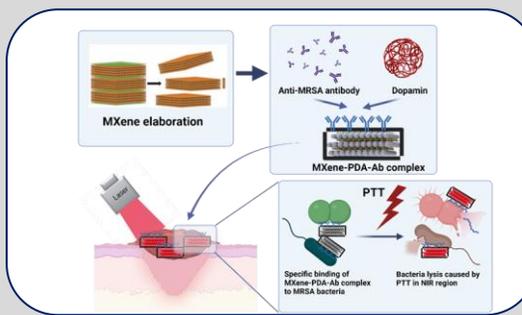
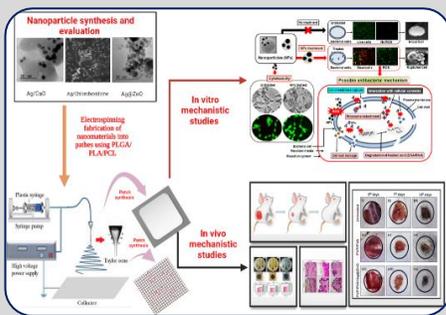
M-Era.Net/Era4Health/LZP



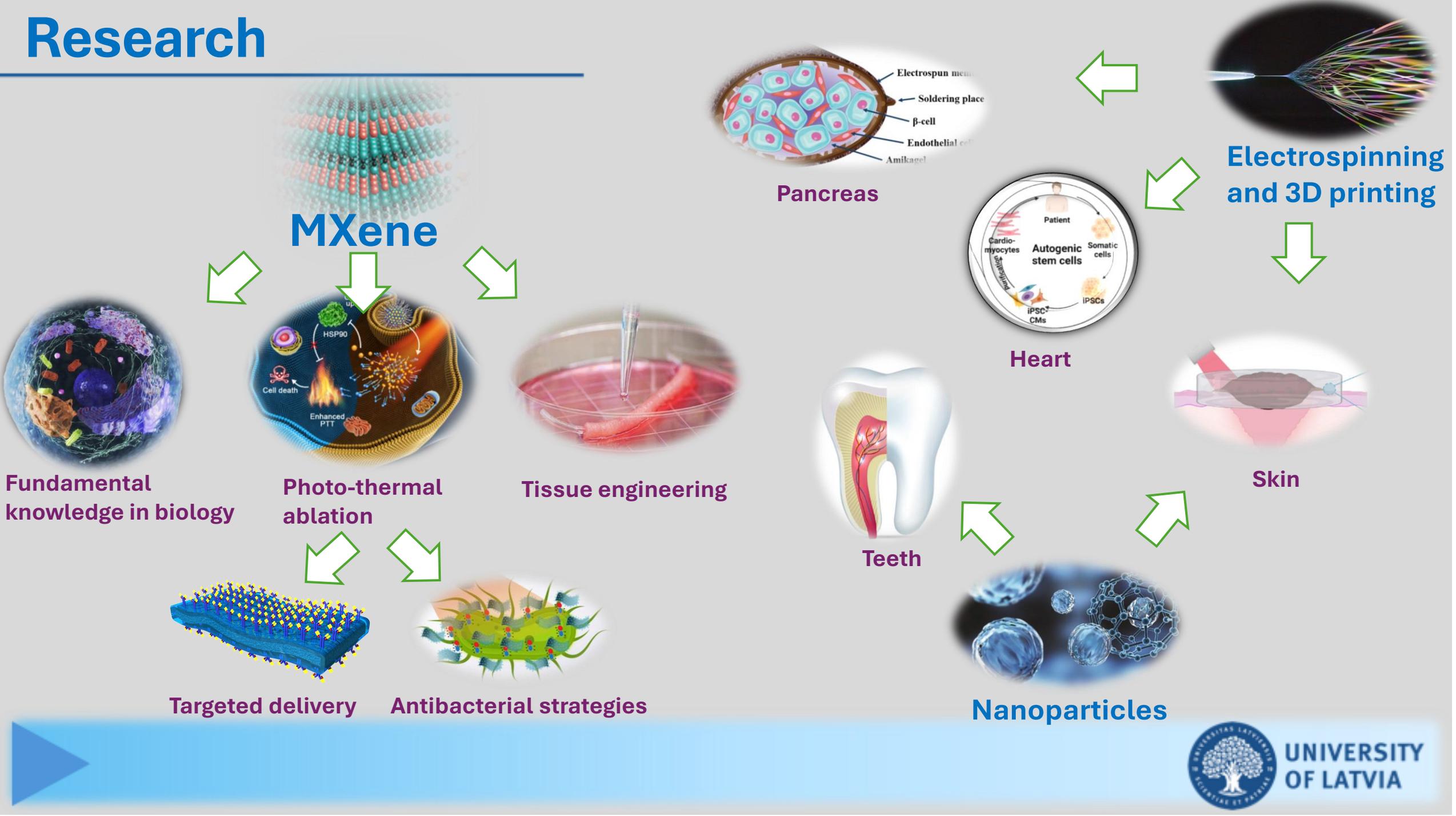

Novel copper-loaded wound healing patches with advanced regeneration capacity and antibacterial effect



Implementation of 2D bi-layered nano-membranes for guided tissue regeneration in endo-perio lesions and periimplantitis

Research



MXene

Electrospinning and 3D printing

Pancreas

Heart

Skin

Teeth

Nanoparticles

Photo-thermal ablation

Tissue engineering

Targeted delivery

Antibacterial strategies

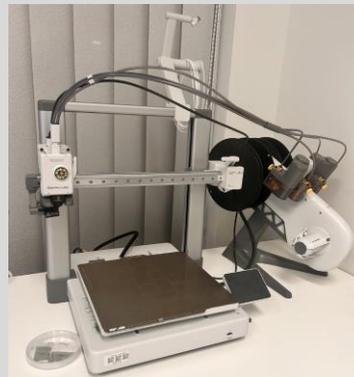
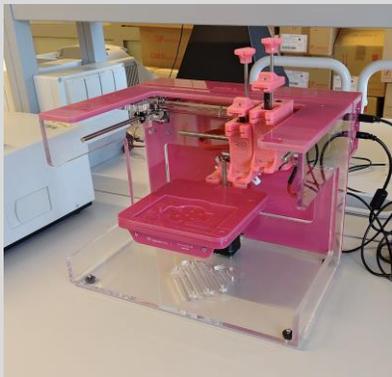
Research facilities and methods

Bacteriology Laboratory

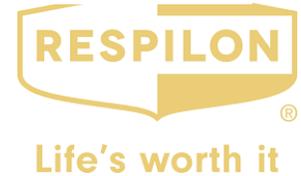


Cell Culture Laboratory

Electrospinning/3D printing



Partners



Publications



Publication	Quartile, IF	Citations (26.02.2025)
Konieva, A., Deineka, V., Diedkova, K. , Aguilar-Ferrer, D., Lyndin, M., Wennemuth, G., Korniienko, V. , Kyrylenko, S., Lihachev, A., Zahorodna, V., Baginskiy, I., Coy, E., Gogotsi, O., Blacha-Grzechnik, A., Simka, W., Kube-Golovin, I., Iatsunskyi, I., & Pogorielov, M. (2024). MXene-Polydopamine-antiCEACAM1 Antibody Complex as a Strategy for Targeted Ablation of Melanoma. <i>ACS Applied Materials and Interfaces</i> , 16(33), 43302–43316. https://doi.org/10.1021/ACSAMI.4C08129	Q1, IF-8.5	5
Kyrylenko, S., Chorna, I., Klishchova, Z., Yanko, I., Roshchupkin, A., Deineka, V., Diedkova, K. , Konieva, A., Petrichenko, O., Kube-Golovin, I., Wennemuth, G., Coy, E., Roslyk, I., Baginskiy, I., Zahorodna, V., Gogotsi, O., Chacon, B., Cartarozzi, L. P., Oliveira, A. L. R., ... Pogorielov, M. (2024). Elucidation of Potential Genotoxicity of MXenes Using a DNA Comet Assay. <i>ACS Applied Bio Materials</i> . https://doi.org/10.1021/ACSABM.4C01142	Q1, IF-4.7	-
Navitski, I., Ramanaviciute, A., Ramanavicius, S., Pogorielov, M. , & Ramanavicius, A. (2024). MXene-Based Chemo-Sensors and Other Sensing Devices. <i>Nanomaterials</i> , 14(5). https://doi.org/10.3390/NANO14050447	Q1, IF-4.4	16
Korniienko, V. , Husak, Y., Diedkova, K. , Varava, Y., Grebnevs, V., Pogorielova, O., Bērtiņš, M., Korniienko, V., Zandersone, B., Ramanaviciene, A., Ramanavicius, A., & Pogorielov, M. (2024). Antibacterial Potential and Biocompatibility of Chitosan/Polycaprolactone Nanofibrous Membranes Incorporated with Silver Nanoparticles. <i>Polymers</i> , 16(12). https://doi.org/10.3390/POLYM16121729	Q1, IF-4.7	7
Holubnycha, V., Husak, Y., Korniienko, V. , Bolshanina, S., Tveresovska, O., Myronov, P., Holubnycha, M., Butsyk, A., Borén, T., Banasiuk, R., Ramanavicius, A., & Pogorielov, M. (2024). Antimicrobial Activity of Two Different Types of Silver Nanoparticles against Wide Range of Pathogenic Bacteria. <i>Nanomaterials</i> , 14(2). https://doi.org/10.3390/NANO14020137	Q1, IF-4.4	11
Ferrara, V., Perfili, C., Artemi, G., Iacolino, B., Sciandra, F., Perini, G., Fusco, L., Pogorielov, M. , Delogu, L. G., Papi, M., De Spirito, M., & Palmieri, V. (2024). Advanced approaches in skin wound healing – a review on the multifunctional properties of MXenes in therapy and sensing. <i>Nanoscale</i> , 16(40), 18684–18714. https://doi.org/10.1039/D4NR02843K	Q1, IF-5.8	4
Leśniak, K., Kołkowska, A., Dulski, M., Blacha-Grzechnik, A., Babilas, D., Rokosz, K., Raaen, S., Pogorielov, M. , Kazek-Kęsik, A., & Simka, W. (2024). Electrochemical modification of the Ti[sbnd]15Mo alloy surface in solutions containing Ag ₂ O, Ag ₃ PO ₄ and Ca ₃ (PO ₄) ₂ particles. <i>Surface and Coatings Technology</i> , 489. https://doi.org/10.1016/J.SURFCOAT.2024.131063	Q1, IF-5.4	-

Publications

Publication	Quartile, IF	Citations (26.02.2025)
Husak, Y., Olszaniecki, J., Pykacz, J., Ossowska, A., Blacha-Grzechnik, A., Waloszczyk, N., Babilas, D., Korniienko, V., Varava, Y., Diedkova, K. , Kyrylenko, S., Hodzic, A., Krichbaum, M., Lu, X., Dryhval, B., Pogorielov, M. , & Simka, W. (2024). Influence of silver nanoparticles addition on antibacterial properties of PEO coatings formed on magnesium. <i>Applied Surface Science</i> , 654. https://doi.org/10.1016/J.APSUSC.2024.159387	Q1, IF-6.3	13
Myndrul, V., Yanovska, A., Babayevska, N., Korniienko, V. , Diedkova, K. , Jancelewicz, M. , Pogorielov, M. , & Iatsunskiy, I. (2024). 1D ZnO–Au nanocomposites as label-free photoluminescence immunosensors for rapid detection of <i>Listeria monocytogenes</i> . <i>Talanta</i> , 271. https://doi.org/10.1016/J.TALANTA.2024.125641	Q1, IF-5.6	8
Gnilitskyi, I., Dolgov, L., Tamm, A., Ferrara, A. M., Diedkova, K., Kopanchuk, S., Tsekhmister, Y., Veiksina, S., Polewczyk, V., & Pogorielov, M. (2024). Enhanced osteointegration and osteogenesis of osteoblast cells by laser-induced surface modification of Ti implants. <i>Nanomedicine: Nanotechnology, Biology, and Medicine</i> , 62. https://doi.org/10.1016/J.NANO.2024.102785	Q1-2, IF-4.2	1
Butsyk, A., Varava, Y., Moskalenko, R., Husak, Y., Pidubnyi, A., Denysenko, A., Korniienko, V., Ramanaviciute, A., Banasiuk, R., Pogorielov, M. , Ramanavicius, A., & Korniienko, V. (2024). Copper Nanoparticle Loaded Electrospun Patches for Infected Wound Treatment: From Development to In-Vivo Application. <i>Polymers</i> , 16(19). https://doi.org/10.3390/POLYM16192733	Q1, IF-4.7	-
Husak, Y., Ma, J., Wala-Kapica, M., Leśniak, K., Babilas, D., Blacha-Grzechnik, A., Dulski, M., Gawecki, R., Matuła, I., Dercz, G., Pogorielov, M. , Lu, X., & Simka, W. (2024). Antibacterial coatings on magnesium formed via plasma electrolytic oxidation in CuO suspension. <i>Materials Chemistry and Physics</i> , 323. https://doi.org/10.1016/J.MATCHEMPHYS.2024.129627	Q1-2, IF-4.3	4
Korniienko, V. , Varava, Y., Banasiuk, R., Korniienko, V., Diedkova, K., Petricenko, O., Arora, D., Denysenko, A., Moskalenko, R., & Pogorielov, M. (2024). Layer-by-Layer Chitosan/PCL Electrospun Membrane Loaded with Copper Nanoparticles as Antibacterial Wound Healing Dressing. <i>Advanced Structured Materials</i> , 214, 149–162. https://doi.org/10.1007/978-981-97-2667-7_5	Q4	1
Balmages, I., Reinis, A., Kistkins, S., Liepins, J., Pogorielov, M. , Korniienko, V. , Diedkova, K. , Bliznuks, D., Lihachev, A., & Lihacova, I. (2024). <i>Determination of operating parameters of fungal growth signals analyzed by laser speckle contrast imaging</i> . 81. https://doi.org/10.1117/12.3016906	-	1
Yanovska, A., Babayevska, N., Jancelewicz, M., Yatsunskiy, I., & Pogorielov, M. (2024). Synthesis and Characterization of 1D ZnO NPs Modified with Gold. <i>Proceedings of the 2024 IEEE 14th International Conference “Nanomaterials: Applications and Properties”, NAP 2024</i> . https://doi.org/10.1109/NAP62956.2024.10739726	-	-

Editorial responsibility

MXene chemistries in biology, medicine and sensing

An open call for papers for a special collection in **Nanoscale**

Guest edited by



Yury Gogotsi



Lucia Gemma Delogu

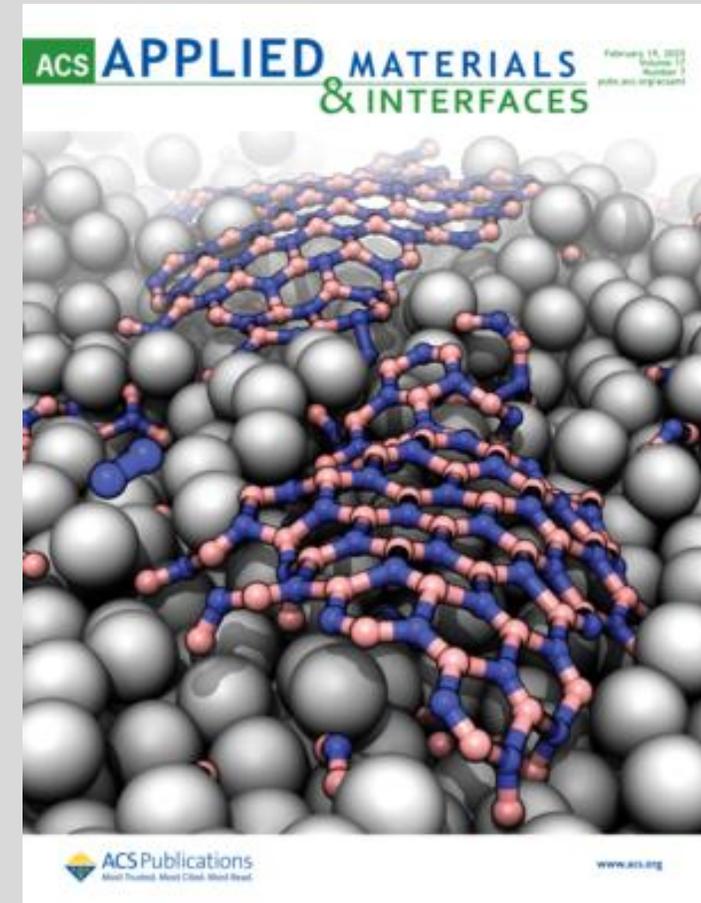


Acelya Yilmazer



Maksym Pogorielov

Open for submissions until 30 September 2024



"Science from Ukraine: Advances in Applied Materials and Interfaces"

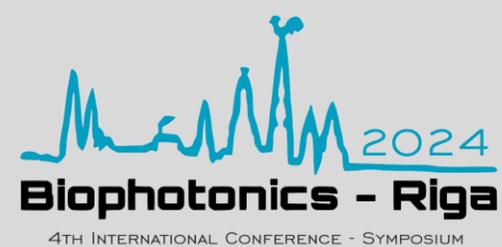
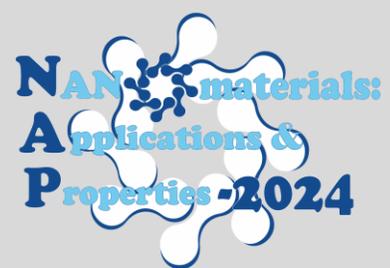
Conferences



Conference abstracts

- Samokhin Y., Varava Y., Korniienko Va., Kukurika V., Shmatkov A., Ptaschenchuk T., Moskalenko R., **Korniienko V.** Electrospun Chitosan/PCL-AgNPs Nanofibrous Membranes as Effective System for Purulent Wounds. Treatment 2024 IEEE 14 International Conference “Nanomaterials: Applications & Properties” (NAP-2024) Riga, Latvia, September 8–13, 2024 12 nra-394.
- Yanovska A., **Korniienko V.**, Radchenko O., Samokhin Y., Husak Y., **Deineka V.** Synthesis of Polylactic Acid Membranes Loaded With Silver Nanoparticles By Electrospinning Technique 2024 IEEE 14 International Conference “Nanomaterials: Applications & Properties” (NAP-2024) Riga, Latvia, September 8–13, 2024 12nra-43.
- Samokhin Y., Varava Y. Antibacterial activity of electrospun chitosan/polylactic acid nanofibers loaded with silver nanoparticles. BIOMEDICAL PERSPECTIVES International Medical Conference; Sumy, 2024, April 24-25, P. 109.
- **Korniienko V.**, Warren K., Varava Y., Korniienko Va., **Diedkova K.**, Zahorodna V., Gogotsi O., Riekstina U., **Pogorielov M.** Antibacterial effectiveness and safety of MXene-loaded electrospun polycaprolactone membranes for photothermal ablation. International conference "YUCOMAT-2024". Herceg Novi, Montenegro. September 2-6, 2024.
- Korniienko Va., Varava Y., Zahorodna V., Gogotsi O., Korniienko V., Pogorielov M. MXene-based antifungal photothermal ablation. International conference "YUCOMAT-2024". Herceg Novi, Montenegro. September 2-6, 2024.
- **Kateryna Diedkova**, Volodymyr Deineka, Yevheniia Husak, Ivan Baginskyi, Serhii Dukhnovskiy et al. “Biomedical Application of Free-Standing $Ti_3C_2T_x$ MXene Films”, IEEE 14th International Conference on Nanomaterials: Application & Properties, Sept. 8-13, 2024, Riga, Latvia-p.69
- Sergiy Kyrylenko, **Kateryna Diedkova**, Inna Chorna, Zhanna Klishchova, Serhii Dukhnovskiy, Ivan Baginskyi, Veronika Zahorodna, et al. “Addressing The Challenge of Peripheral Nerve Injuries with Ti_3C_2 MXene Based Electro-conductive Polymer Nerve Guidance Conduits”, IEEE 14th International Conference on Nanomaterials: Application & Properties, Sept. 8-13, 2024, Riga, Latvia-p.47
- Artem Shmatkov, **Kateryna Diedkova**, Bojan Petrović, Sanja Kojić, Lazar Milić, Milan Radovanović, Ivan Baginskyi, Serhii Dukhnovskiy, et al. “Towards electroconductive polymer scaffolds: polycaprolactone nanofiber membranes with Ti_3C_2 MXene surface coating”, IEEE 14th International Conference on Nanomaterials: Application & Properties, Sept. 8-13, 2024, Riga, Latvia-p.53
- **Lita Grine**, Volodymyr Deineka, **Kateryna Diedkova**, **Ena Gavare**, Anastasia Konieva, et al. “MXene Biocompatibility Depending on Flake Size and Oxidation State”, IEEE 14th International Conference on Nanomaterials: Application & Properties, Sept. 8-13, 2024, Riga, Latvia-p.68
- **Kateryna Diedkova**, **Ena Enia**, **Lita Grine**, Volodymyr Deineka, Mārtiņš Boroduškis et al. “Size Matters: Exploring MXene-Cell Interactions”, the 25th Conference on Material Science, YUCOMAT, September 2-6, 2024, Herceg Novi, Montenegro- p.27
- **K. Diedkova**, V. Zahorodna, O. Gogotsi, U. Riekstina, **M. Pogorielov**, “Biomedical application of MXene for cardiac tissue regeneration”, the 1st EuroMXene Congress, June 26-28, 2024, Valencia, Spain-p.31
- **K. Diedkova**, Vladlens Grebnevs, Ilya Yanko, Veronika Zahorodna, **Oleksiy Gogotsi**, New MXene-containing electroconductive polymer scaffolds for tissue engineering. 82nd International Scientific Conference of the University of Latvia 2024 – Riga, Latvia, February 15 - 16, 2024

IEEE NAP-2024



IEEE NAP-2025



Manuscripts indexed by Scopus

IEEE International Conference "Nanomaterials: Applications & Properties" Bratislava, SLOVAKIA, Sep. 7-12, 2025

CALL FOR PAPERS

MAIN TOPICS: • Synthesis & Nanofabrication • Multifunctional Films & Coatings • Electrochemistry • Carbon-based Nanomaterials & MXenes • Nanoscale Characterization • Ultrawide Bandgap Materials & Photonics • Magnetism, Magnetic Materials & Phenomena • Sensors, Nanodevices & Applications • Nanotechnology for Energy, Water & Environment Applications • Nanomedicine & Bionanotechnology • Quantum Computing & Ultrashort Laser Effects • Theory & Modeling

Explore the latest advances in MXene research in the "The MXene Frontier" Symposium

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REGISTRATION FEES (*)

Regular attendees: 600 EUR
Students: 300 EUR
* Early registration discount 100 EUR (before May 31st 2025)
**Invited Speakers, IEEE Members: 20% discount

IMPORTANT DATES

Abstract Submission: Feb. 01 - Apr. 13, 2025
Paper Submission: May. 01 - May 25, 2025
Early registration fees deadline: May 31, 2025
Program posted online: Aug. 11, 2025
On-site Registration: Sept. 07, 2025

CONFERENCE FORMAT & PRESENTATIONS

Plenary talks - 40 min +5 min for Q&A
Keynote & Invited talks - 25 min +5 min for Q&A
Contributed talks - 12 min +3 min for Q&A
Format for poster presentation is A0 (841 mm (w) x 1189 mm (h))

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Best Paper Awards
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IEEE International Conference "Nanomaterials Applications & Properties" Bratislava, SLOVAKIA, Sep. 7-12, 2025

MXene 2025 Symposium

The MXene Frontier: Transformative Nanomaterials Shaping the Future

PLENARY SPEAKERS:



Prof. Michael NAGUIB Tulane University (USA)
Prof. Babak ANASORI Purdue University (USA)
Prof. Yury GOGOTSI Drexel University (USA)
Prof. Vladimir TSUKRUK Georgia Institute of Technology (USA)
Prof. Patrice SIMON Université Paul Sabatier (France)

MAIN TOPICS: • Synthesis & Nanofabrication • Multifunctional Films & Coatings • Electrochemistry • Carbon-based Nanomaterials • Nanoscale Characterization • Electronic, Photonic & Quantum Materials, Sensing & Properties • Magnetism, Magnetic Materials & Phenomena • Sensors, Nanodevices & Applications • Nanotechnology for Energy, Water & Environment Applications • Nanomedicine & Bionanotechnology • Ultrashort Laser-matter Interactions & Materials Processing • Theory & Modeling

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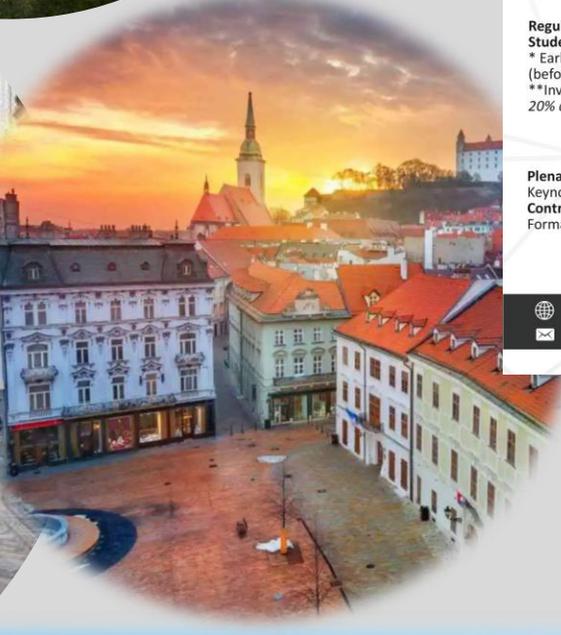
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SCAN ME

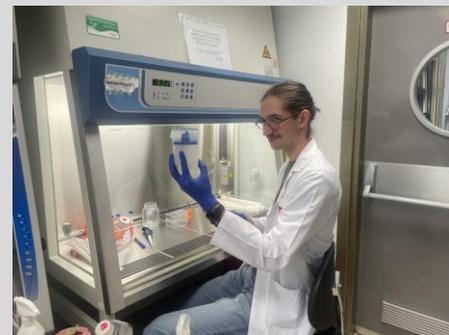
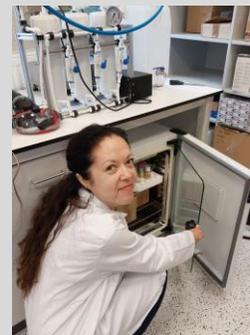
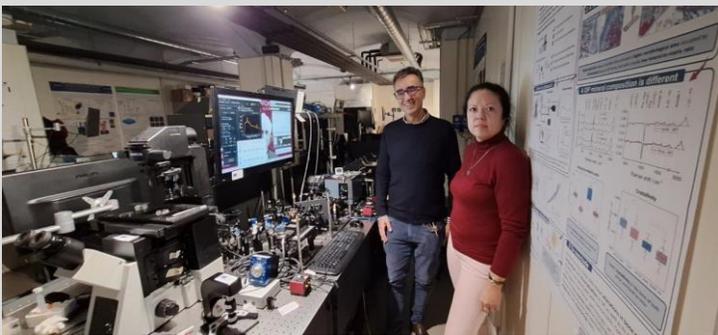
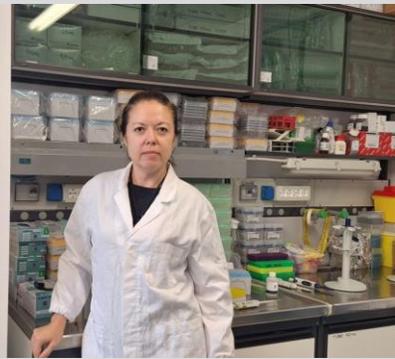
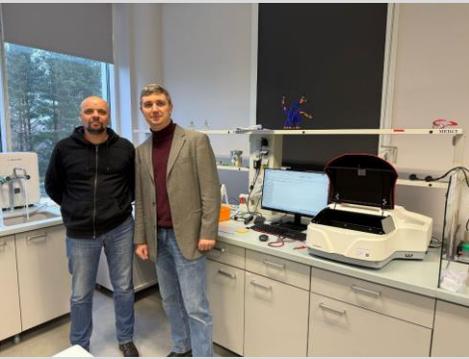
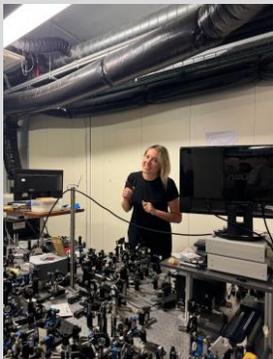


Mid-term meetings

MX-MAP



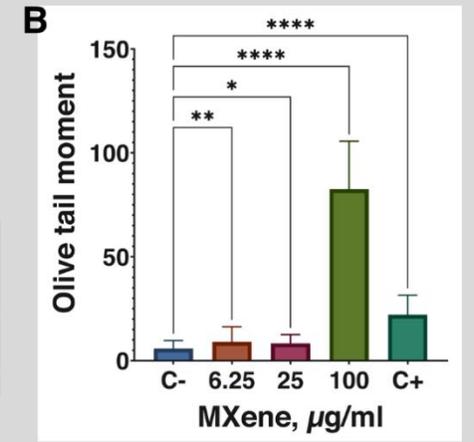
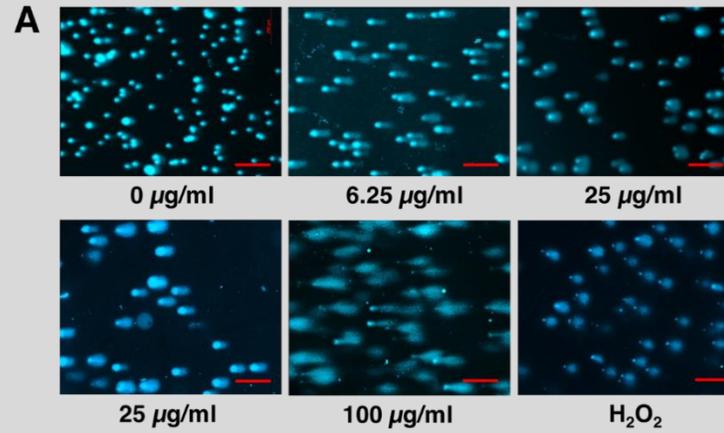
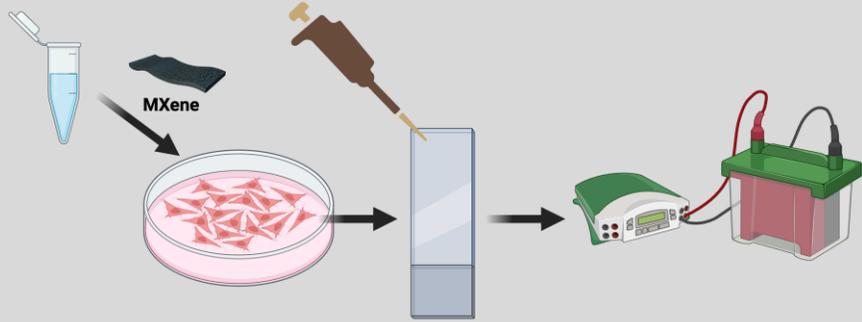
Secondments



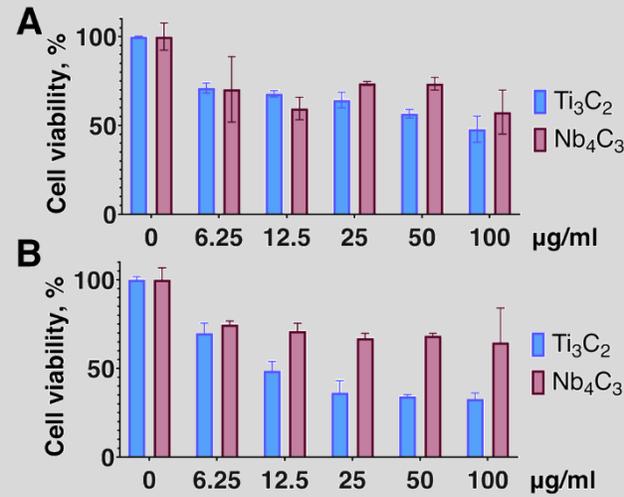
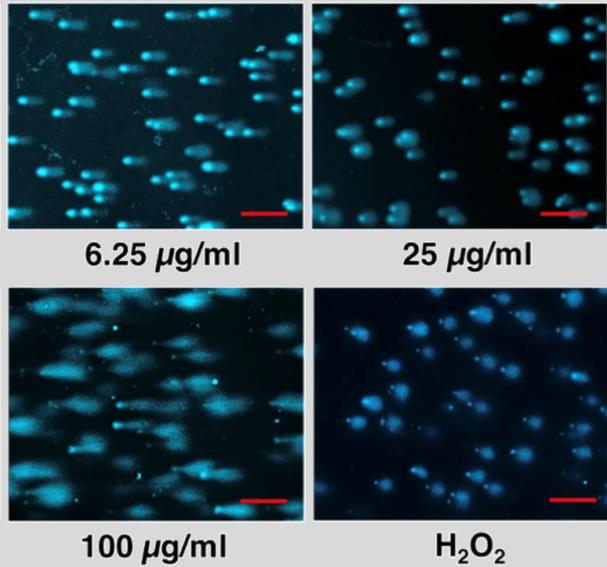
Main research results, 2024



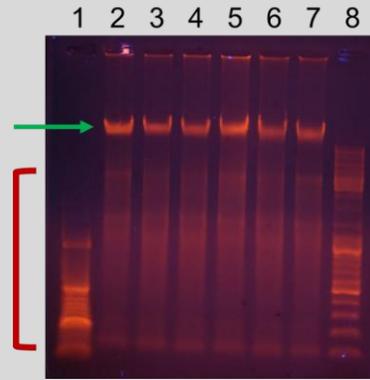
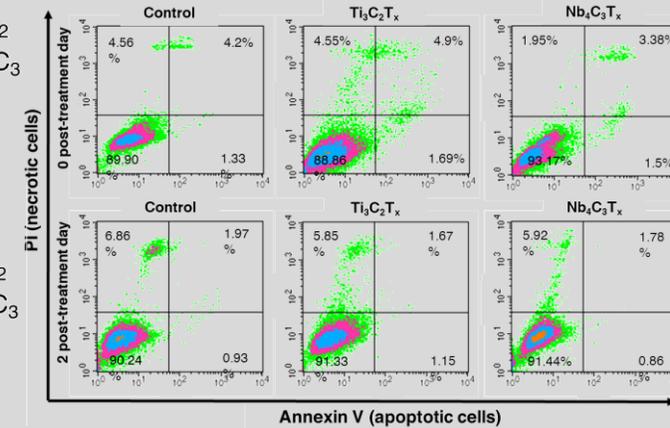
Fundamental biocompatibility



B16F10 mouse melanoma cells loaded with $\text{Ti}_3\text{C}_2\text{T}_x$ MXene

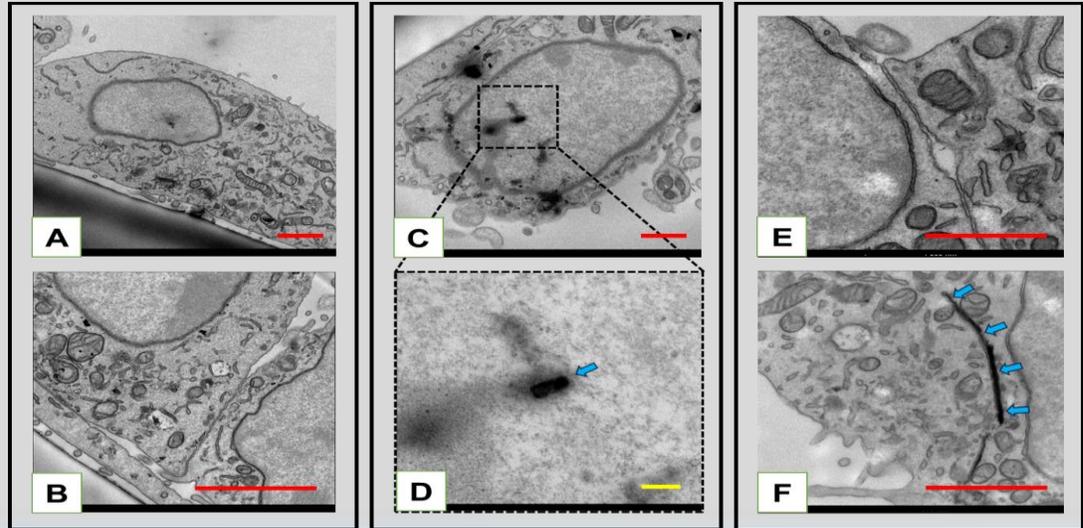
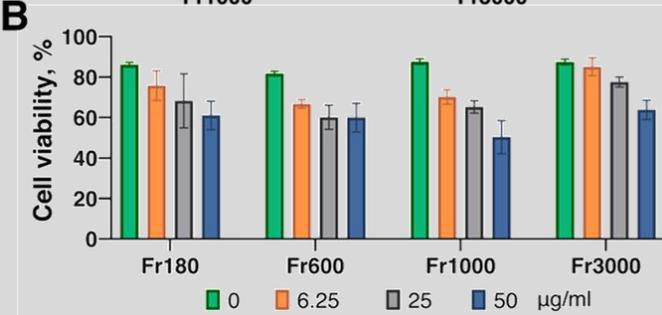
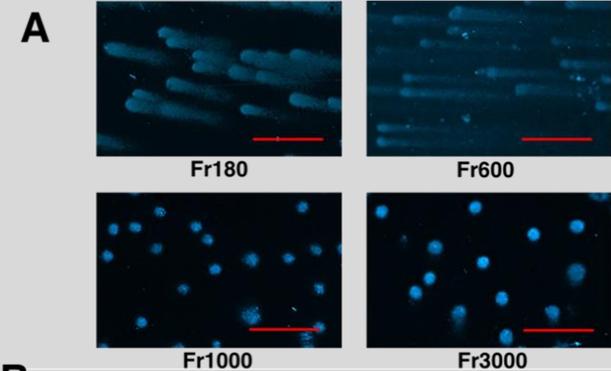
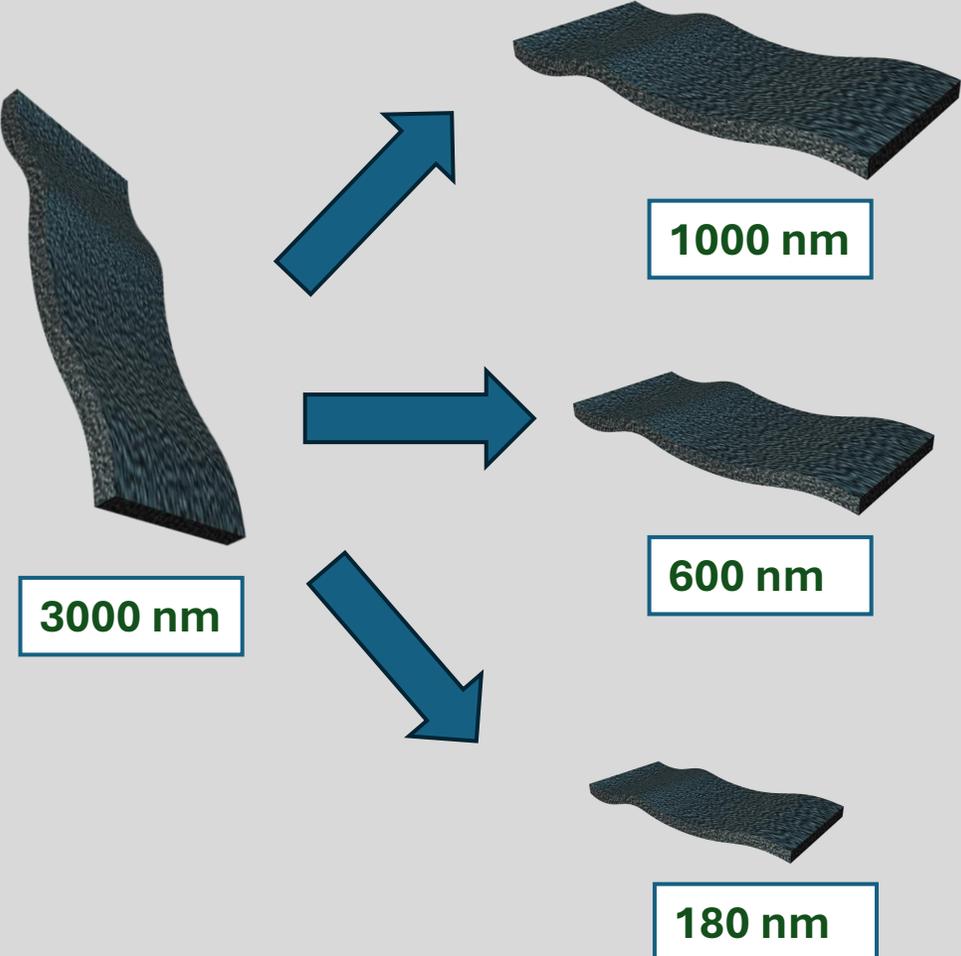


Cells biocompatibility after MXene exposure (24 h)



Agarose gel electrophoresis of the chromosomal DNA

Fundamental biocompatibility



Fundamental biocompatibility

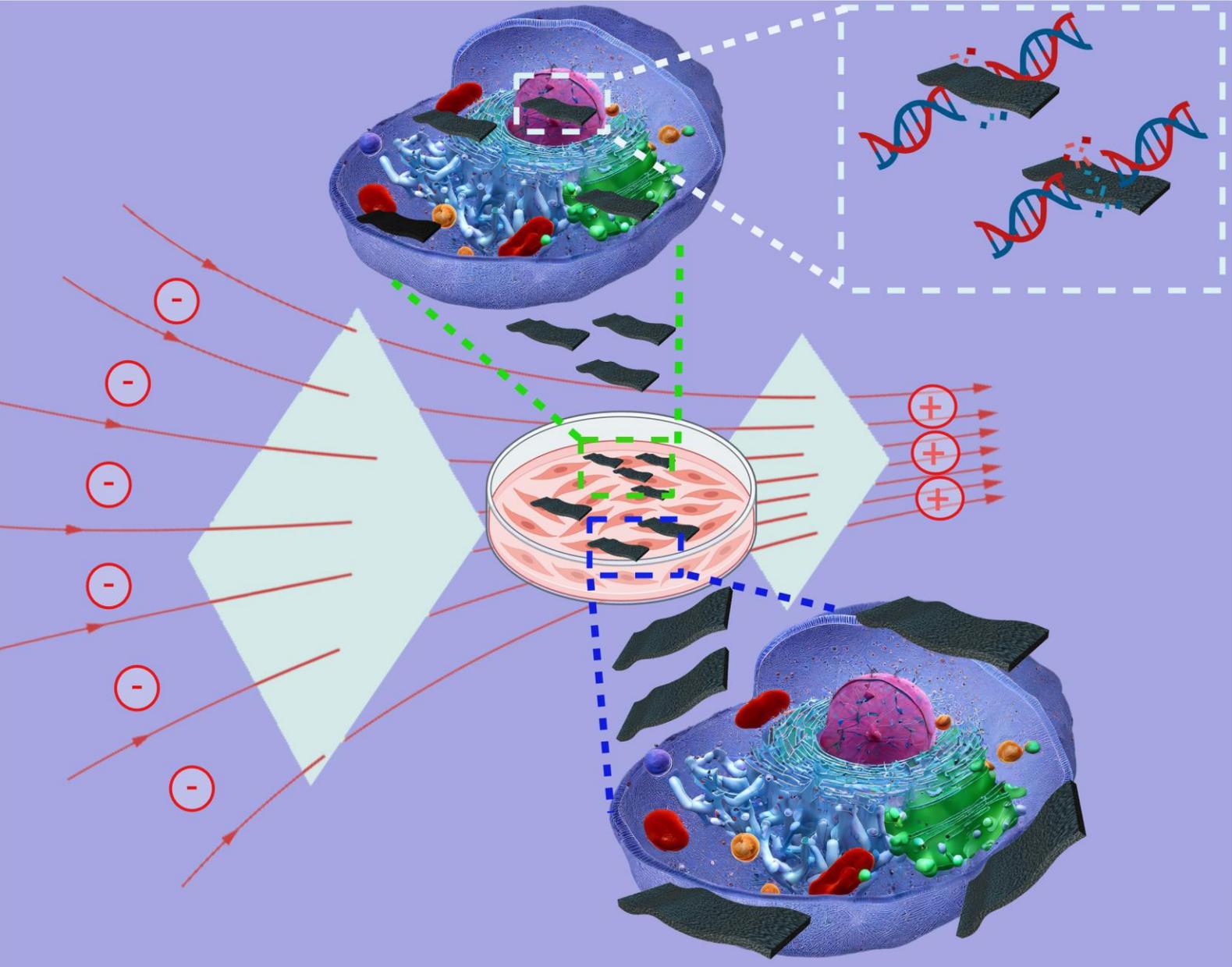
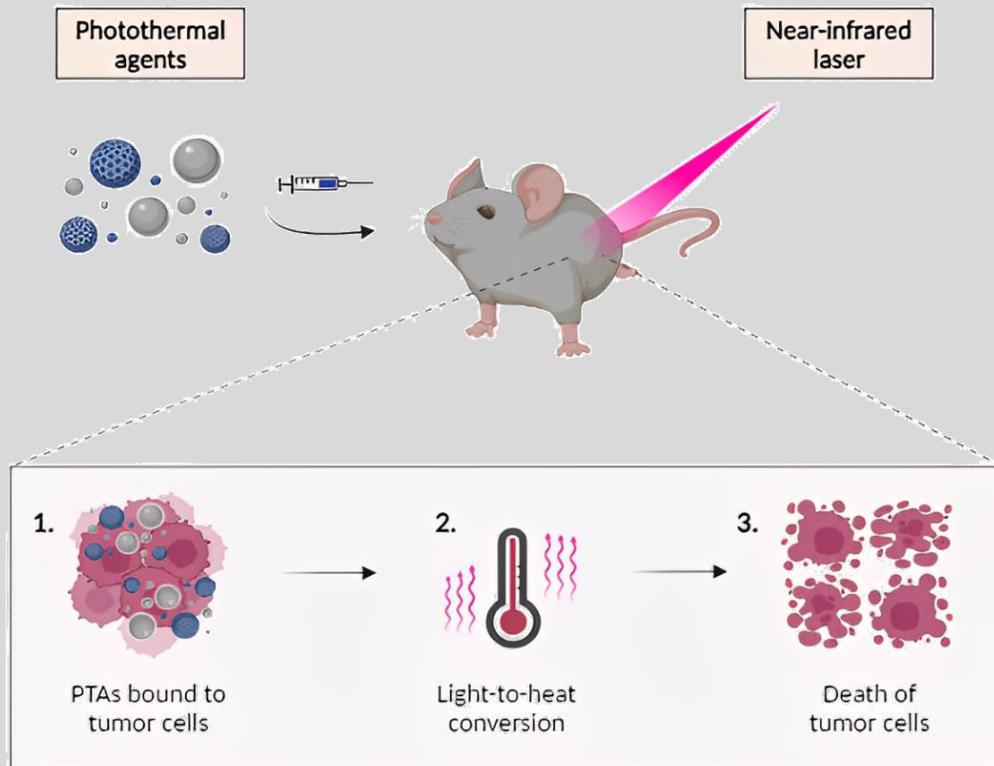
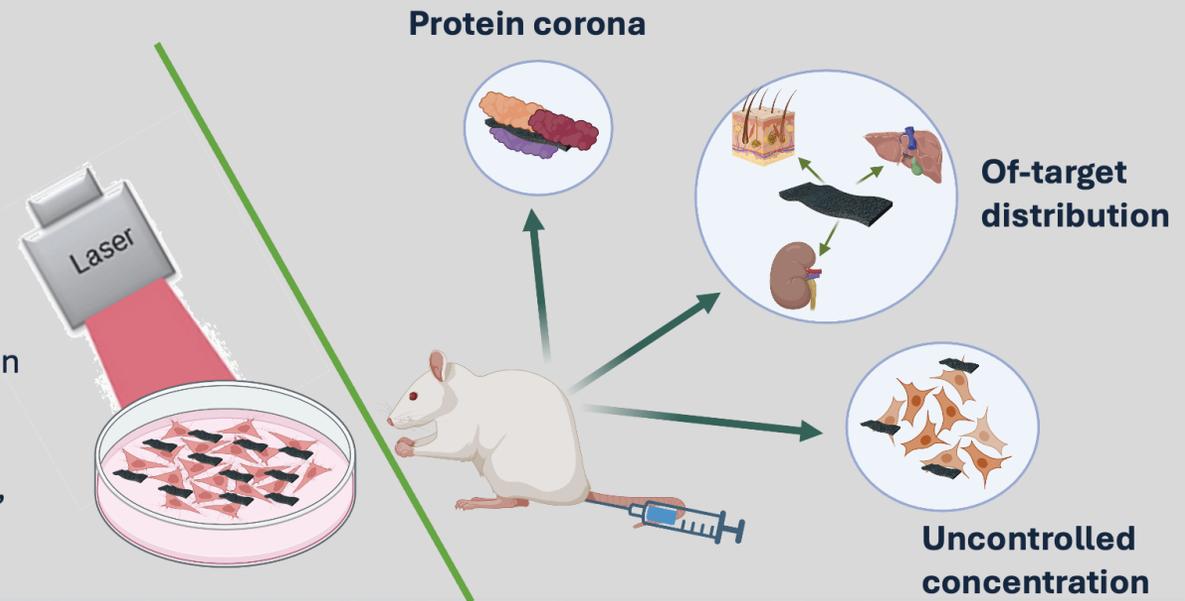


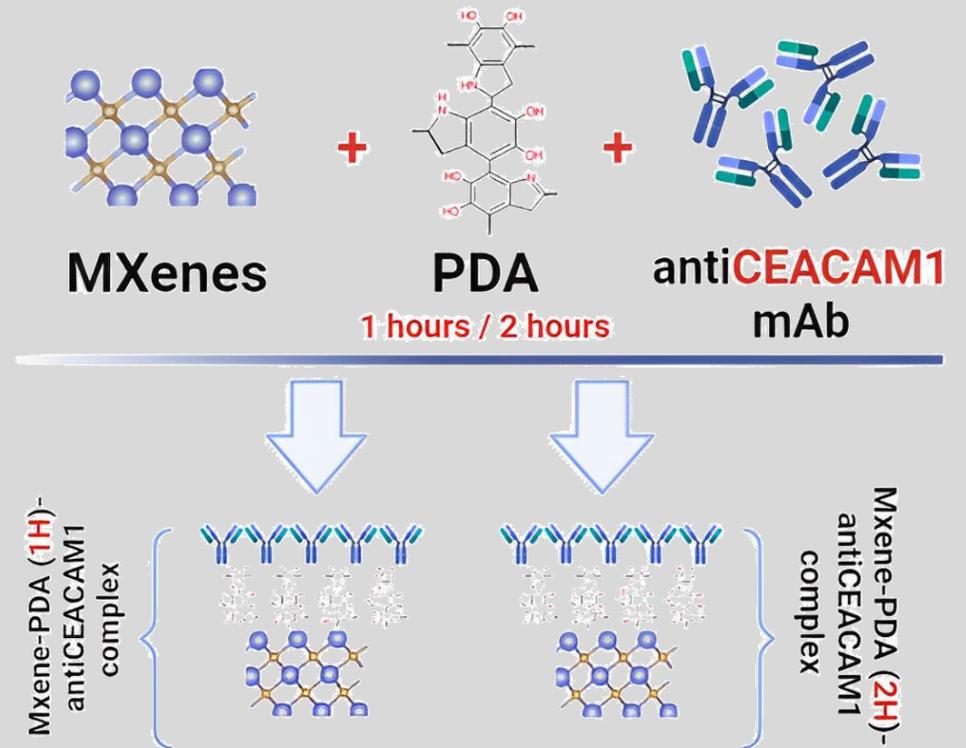
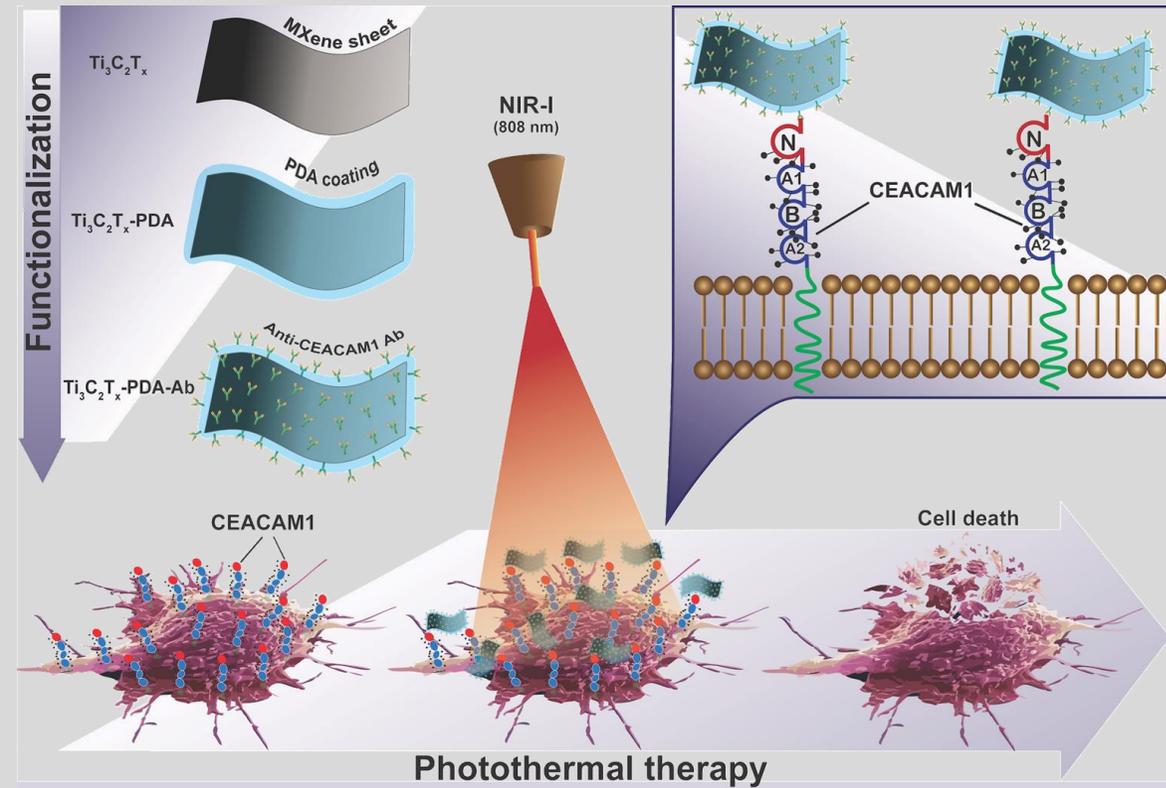
Photo-thermal therapy



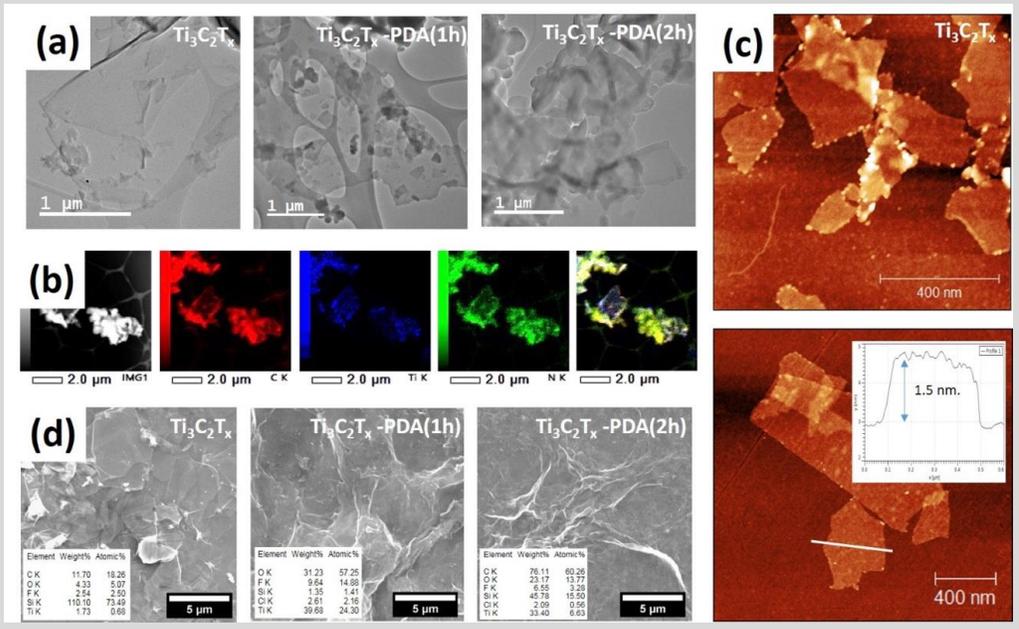
- Controlled concentration
- Controlled distribution
- “No-escape”



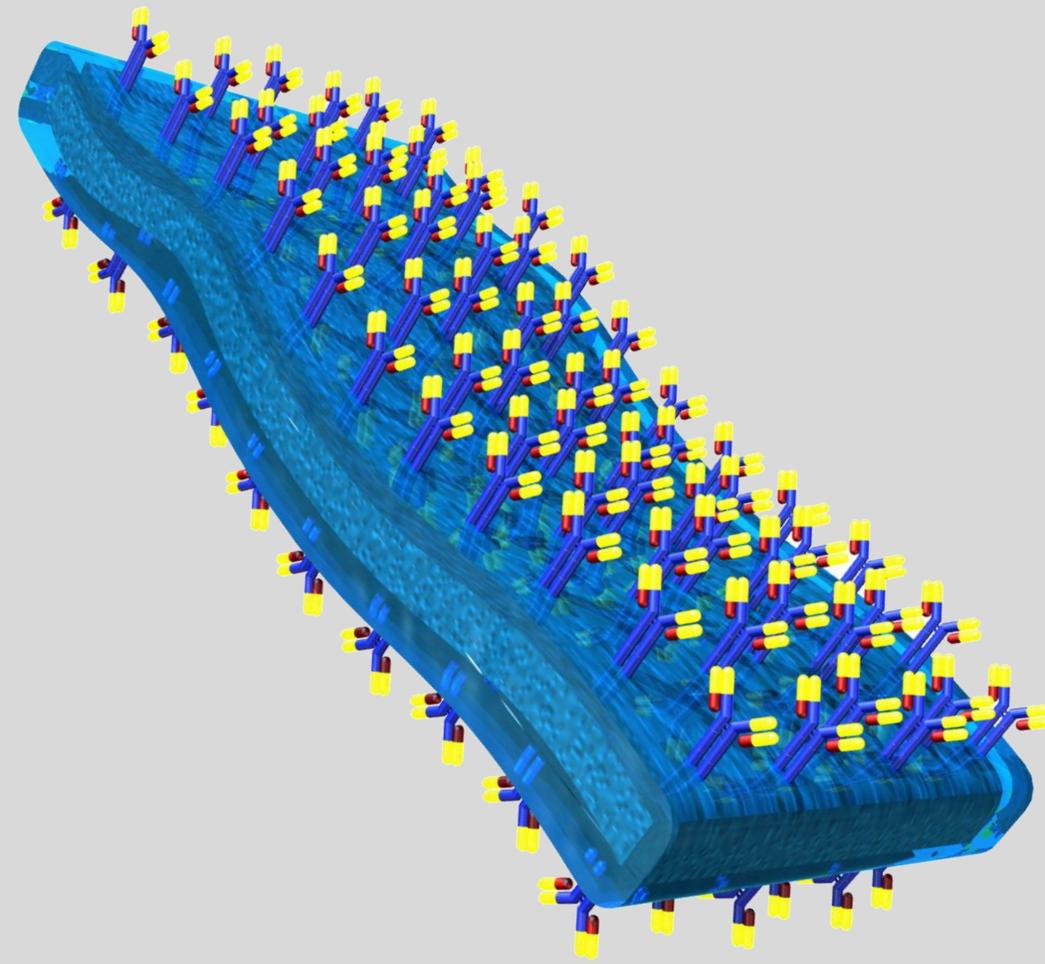
Targeted PTT



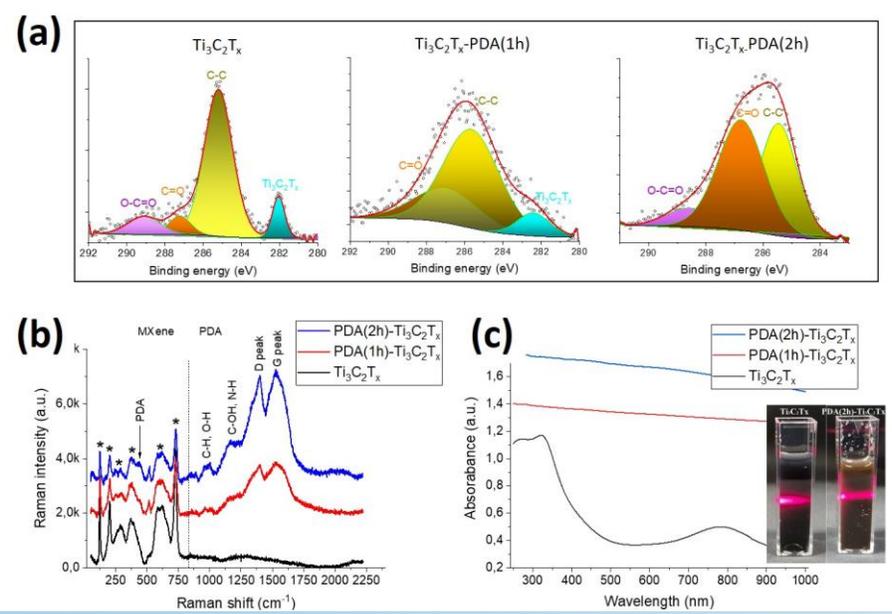
Targeted PTT



(a) TEM images, **(b)** EDX mapping analysis, **(c)** AFM image, **(d)** SEM images and EDX

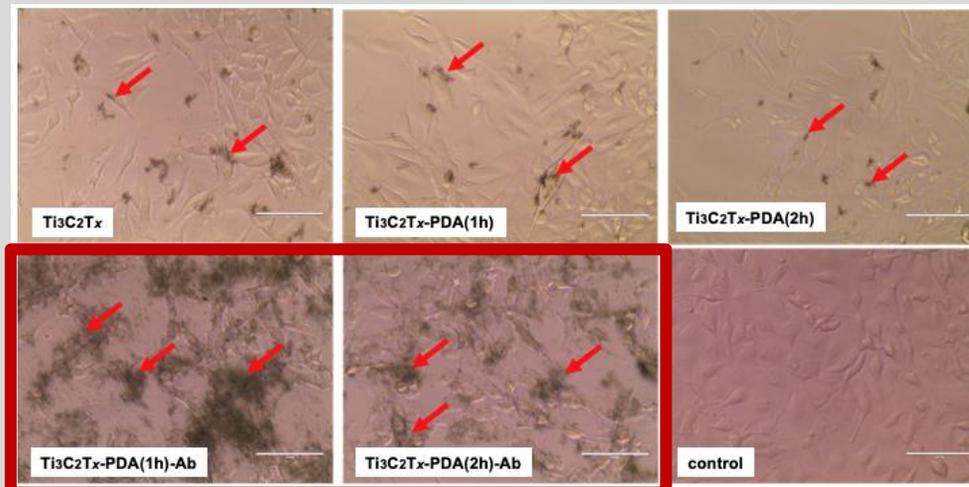
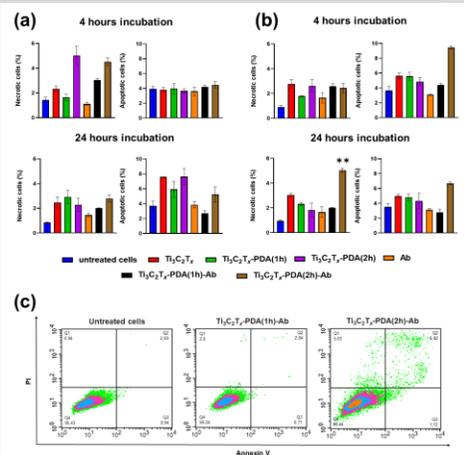
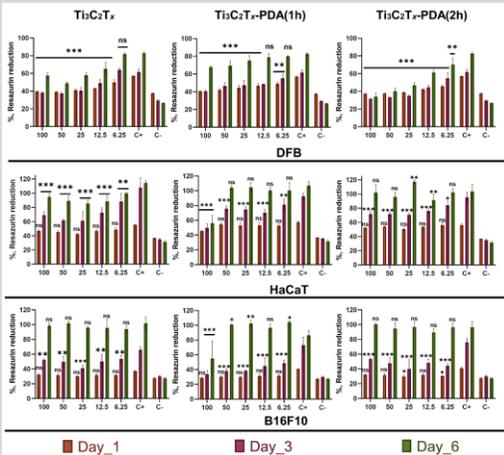


(a) XPS C core-level spectra, **(b)** Raman spectroscopy analysis, **(c)** Absorbance UV-Vis spectroscopy

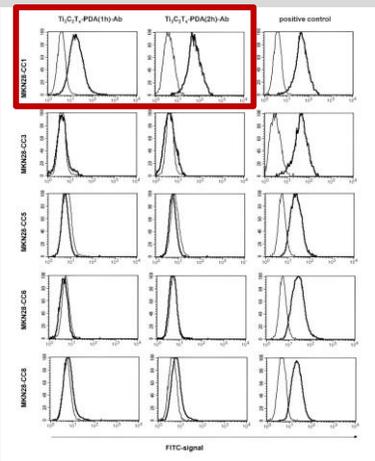
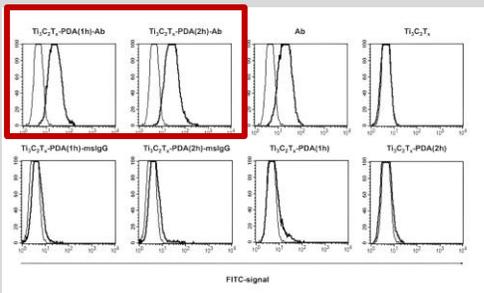


Targeted PTT

CEACAM1-positive cells

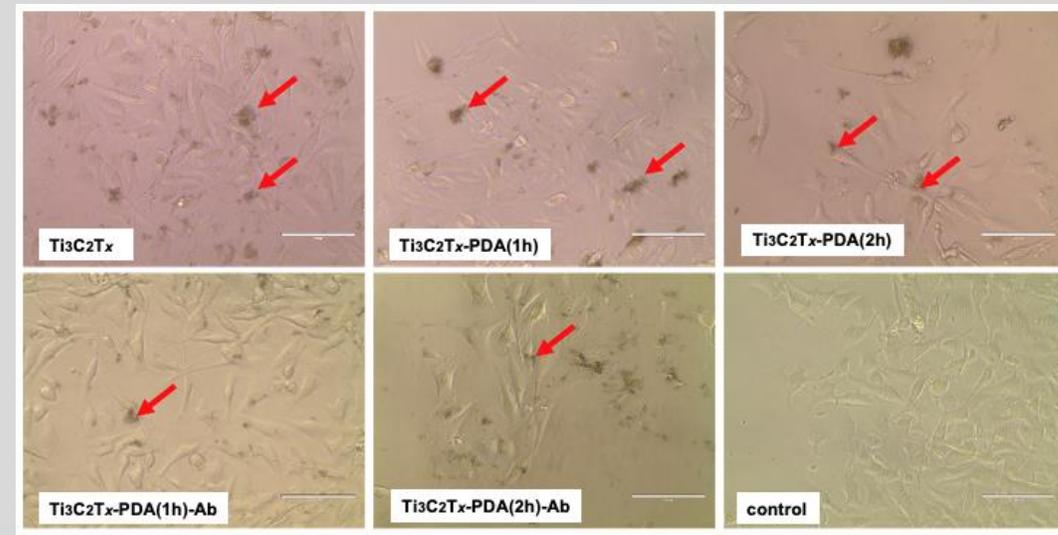


Biocompatibility



Specificity and cross-reactivity

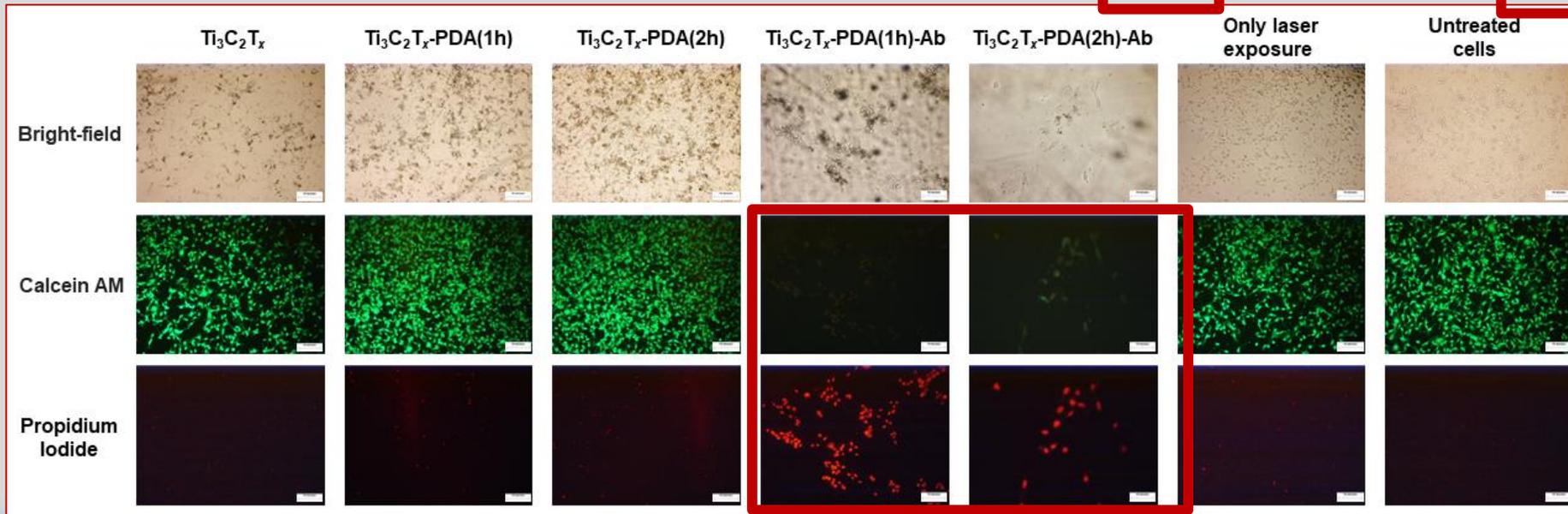
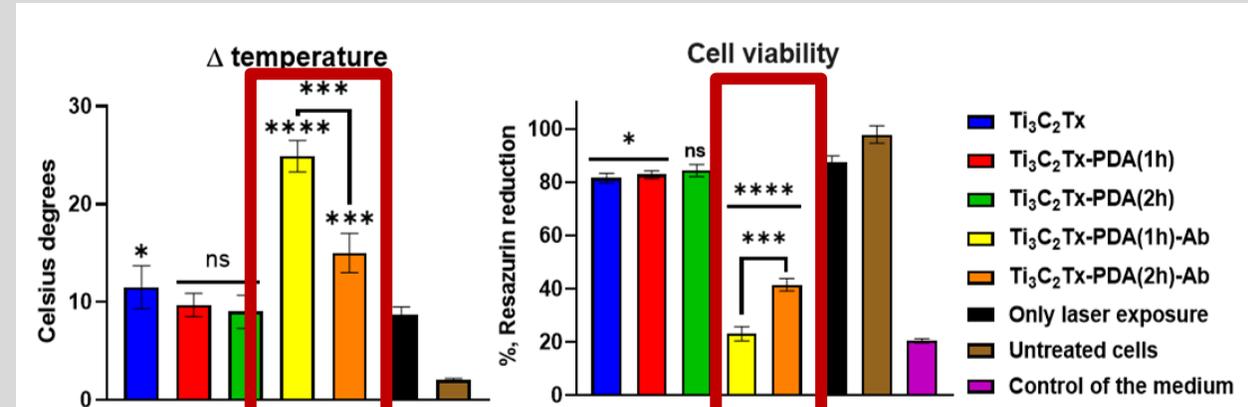
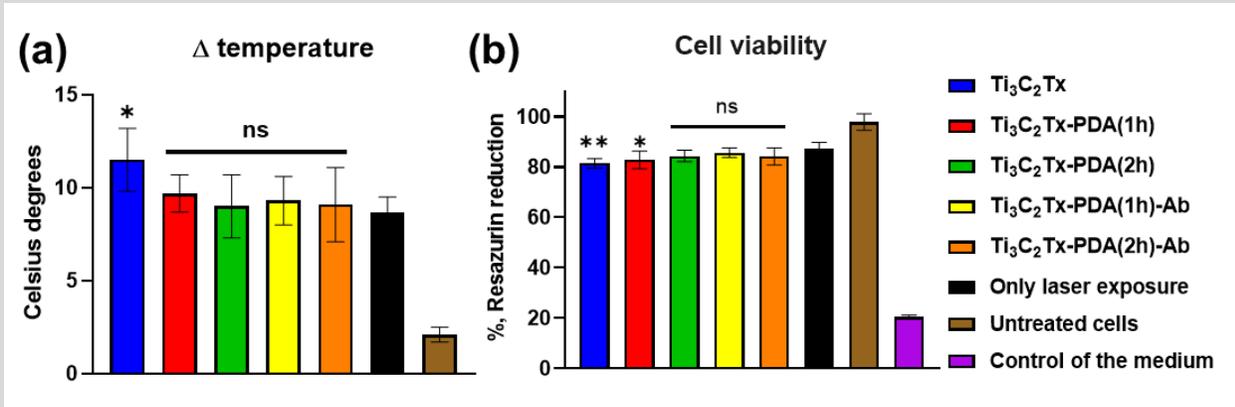
CEACAM1-negative cells



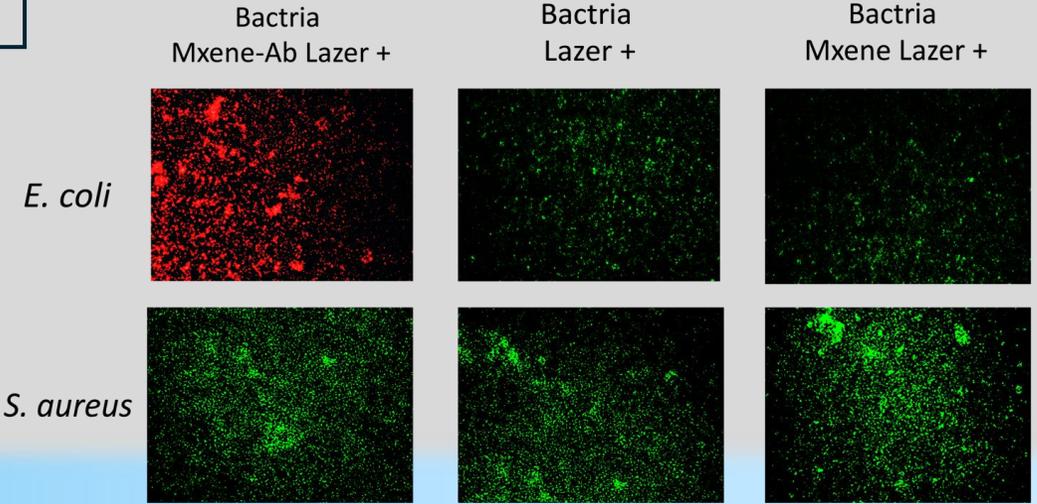
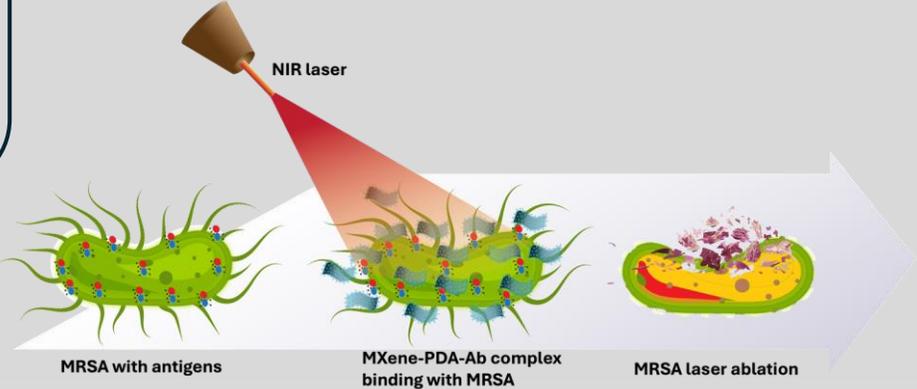
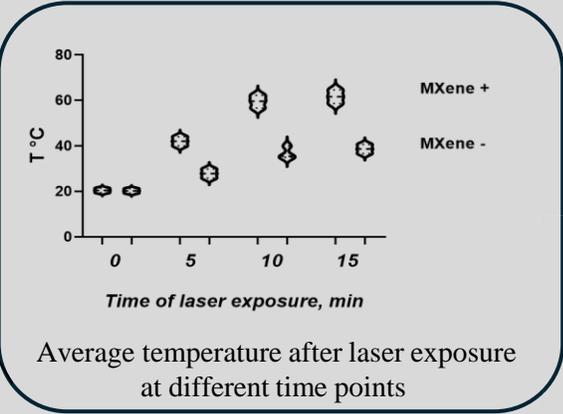
Targeted PTT

CEACAM1-negative cells

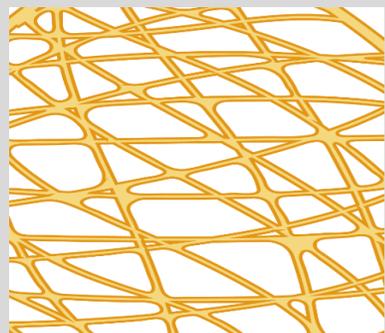
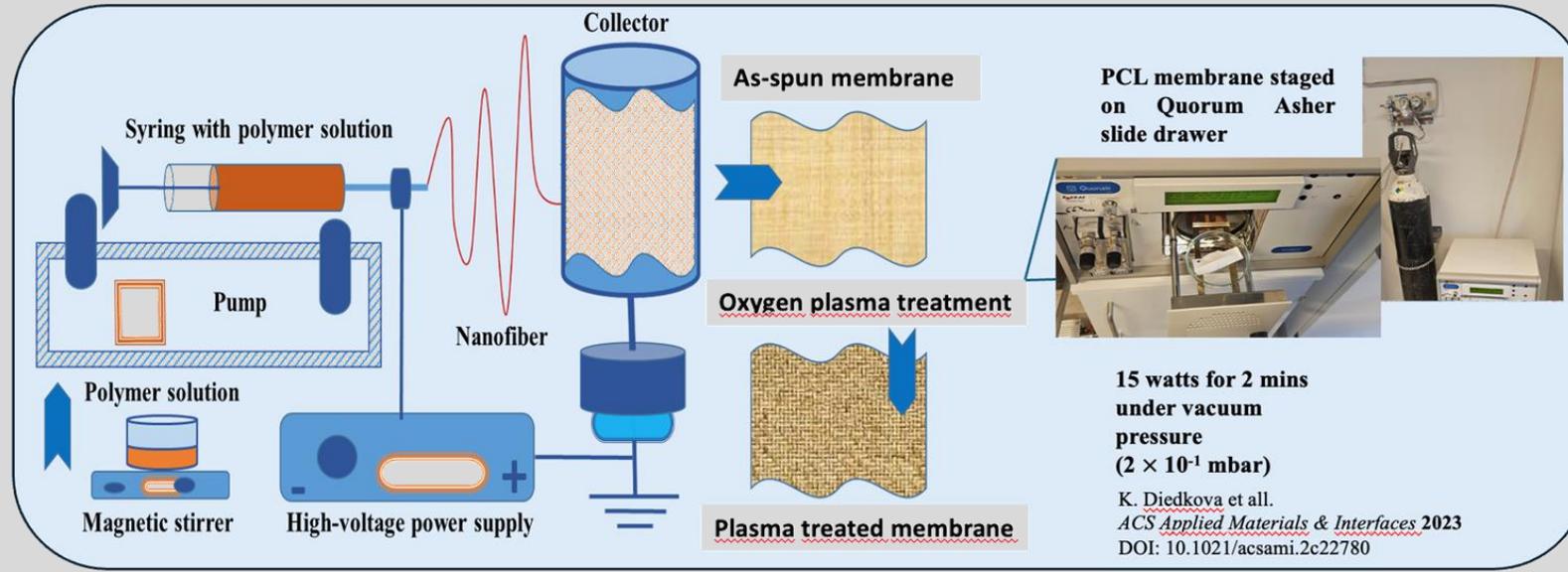
CEACAM1-positive cells



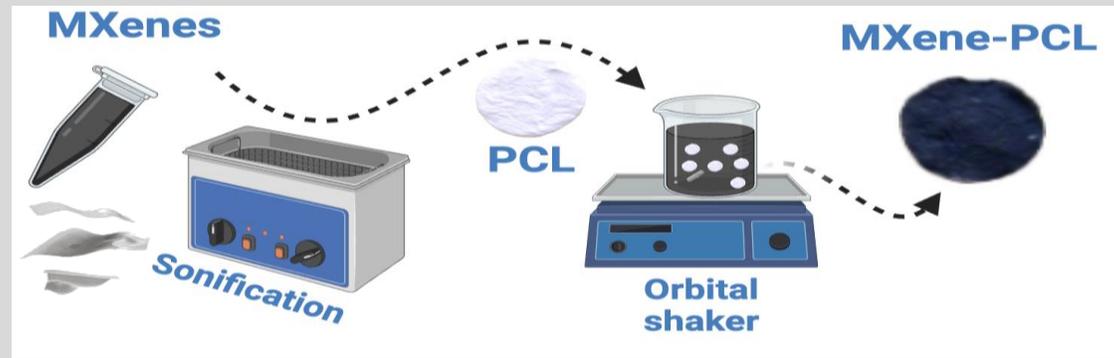
Antibacterial applications of MXenes



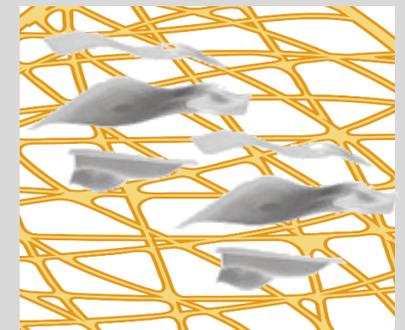
Antibacterial applications of MXenes



3D as-spun matrix

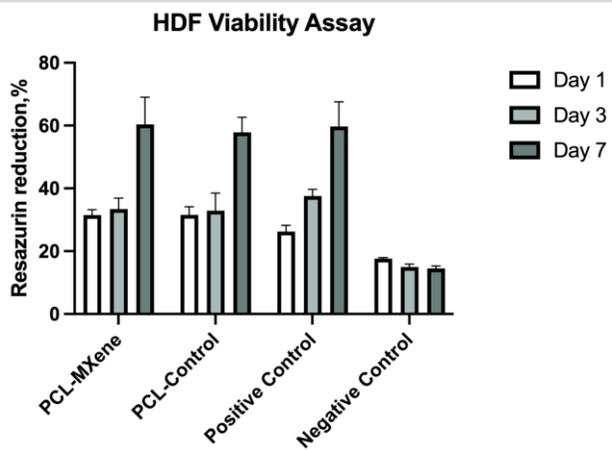


Ti_3C_2 MXene in solution

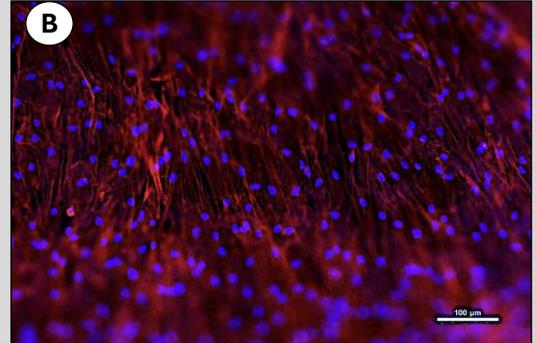
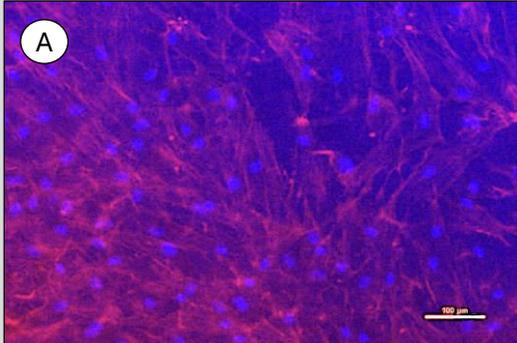


Electrospun matrix loaded with MXenes

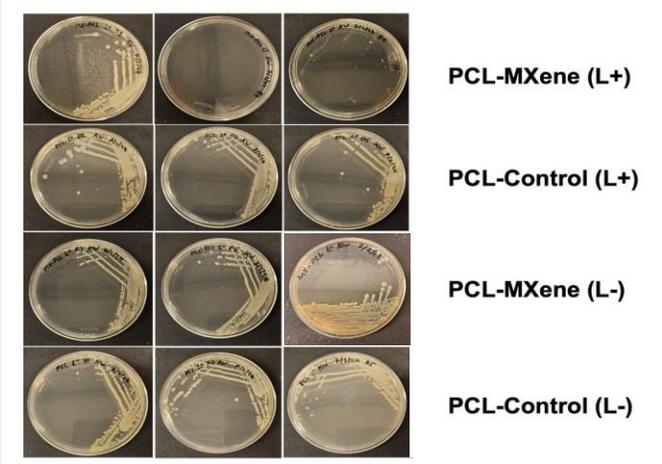
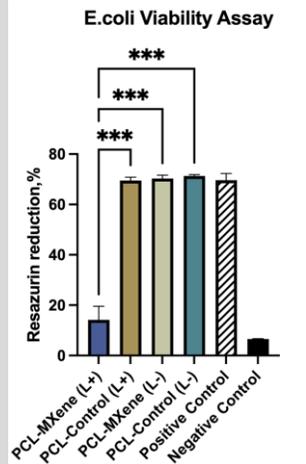
Antibacterial applications of MXenes



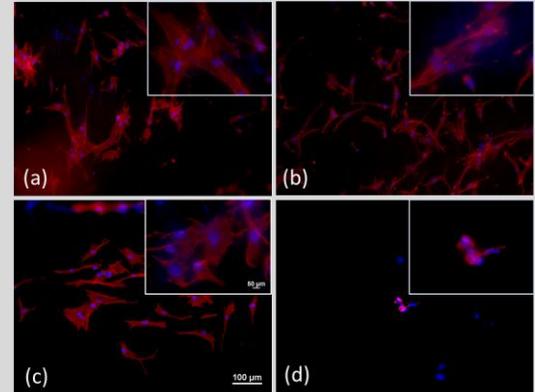
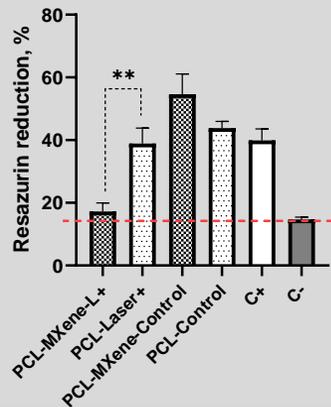
Human dermal fibroblast viability



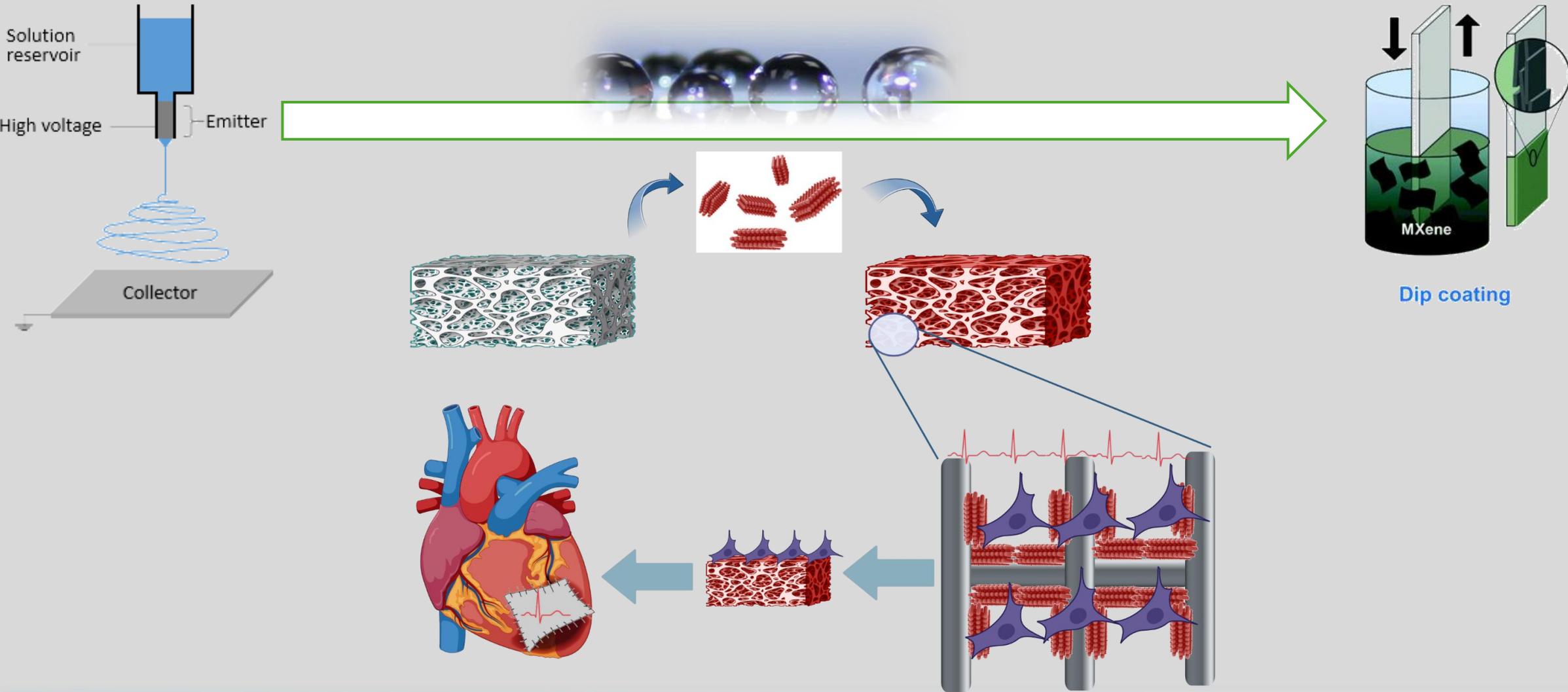
NIR laser ablation



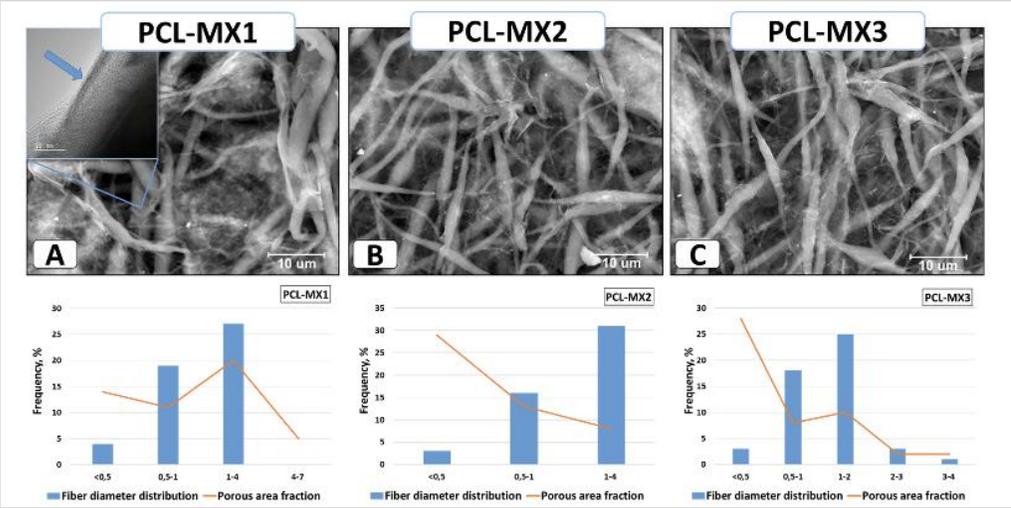
Biocompatibility after NIR irradiation



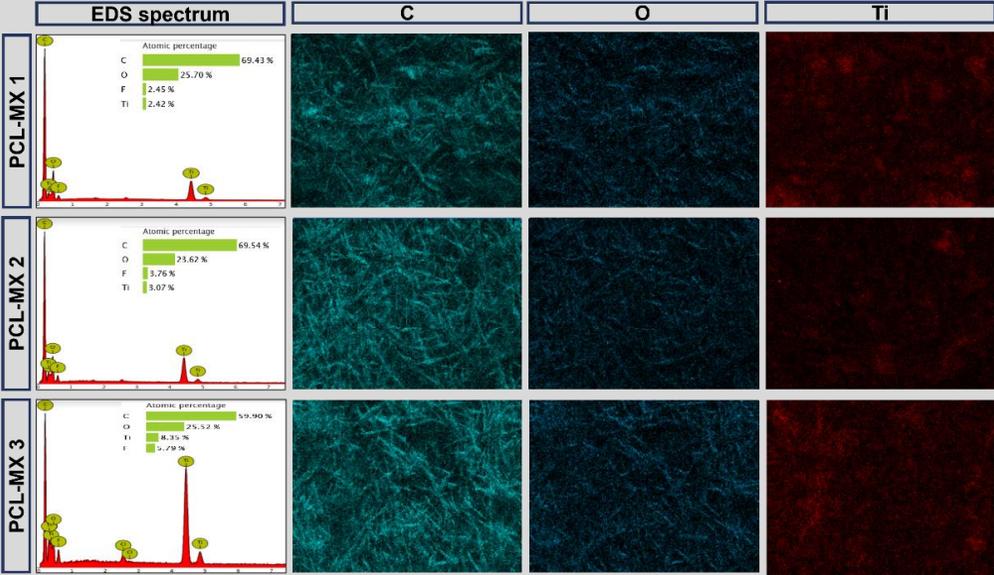
Electroconductive Scaffolds for Cardiac Tissue Engineering



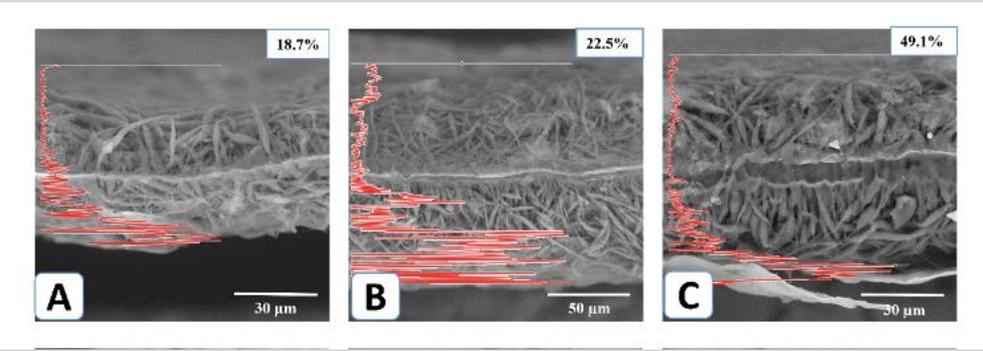
Electroconductive Scaffolds for Cardiac Tissue Engineering



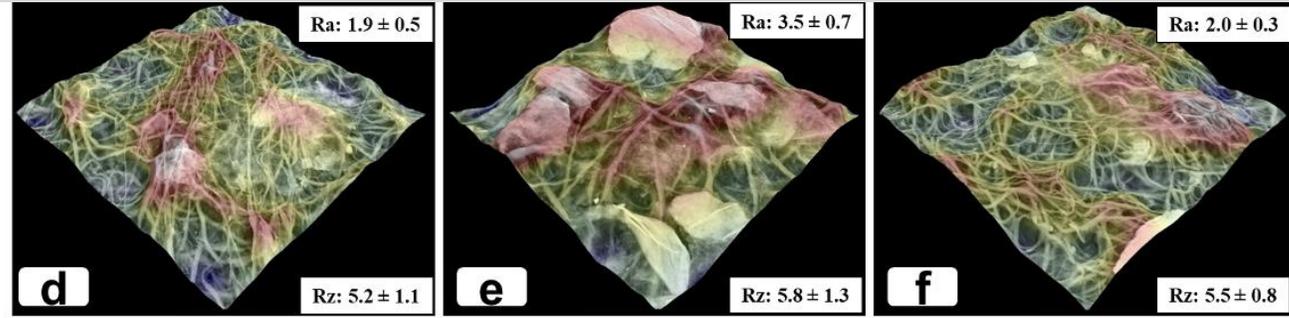
SEM with pore and fiber diameter distribution



EDS mapping



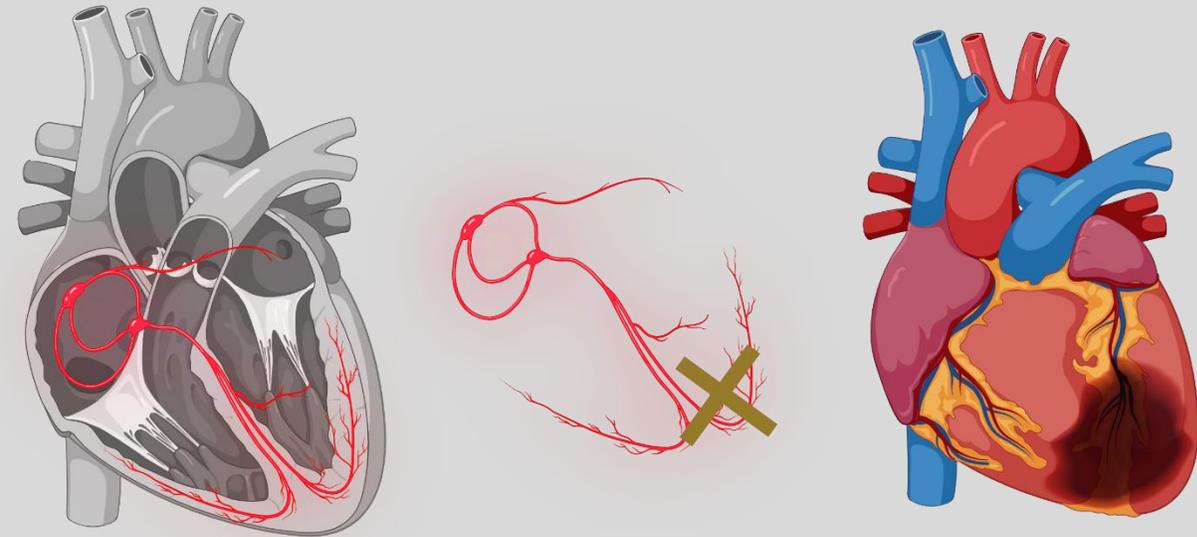
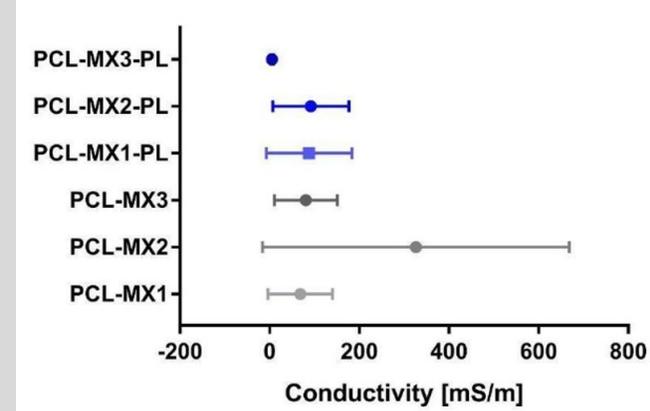
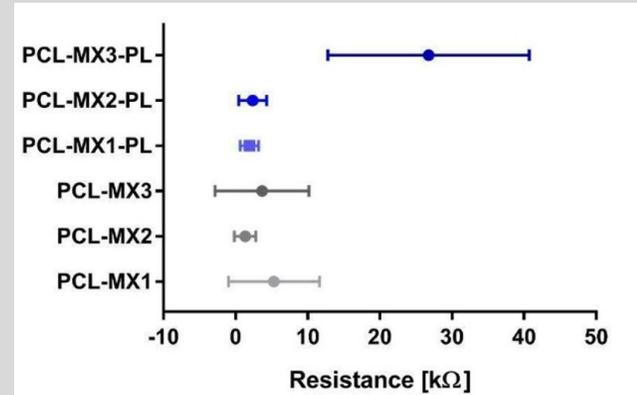
EDS crosssection (Ti distribution)



3D reconstruction of surface morphology

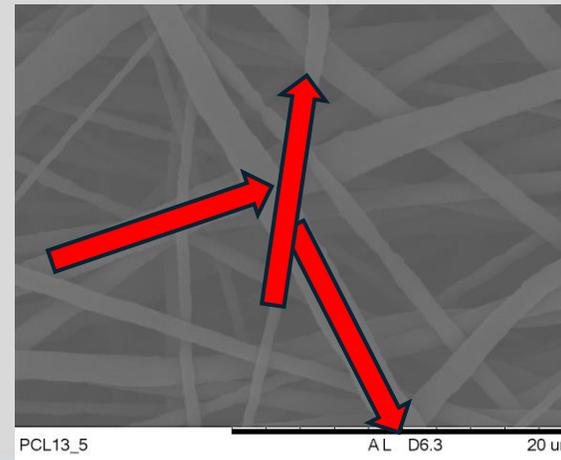
Electroconductive Scaffolds for Cardiac Tissue Engineering

Measured resistance

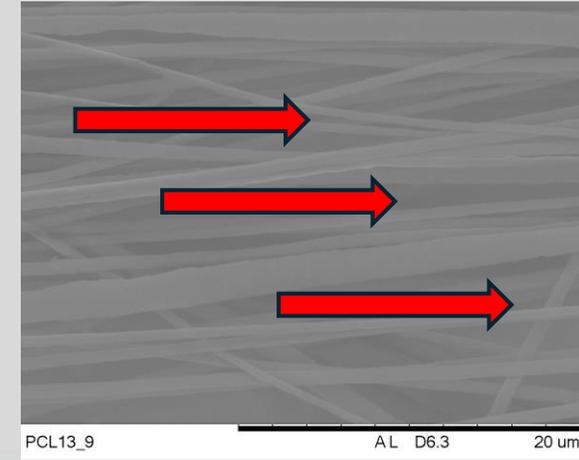


Fibers orientation

Randomly oriented



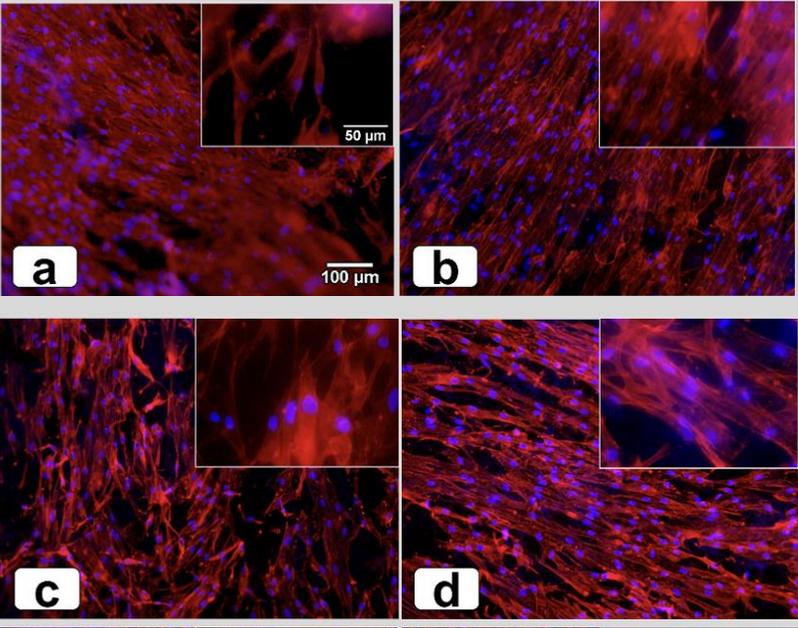
Aligned



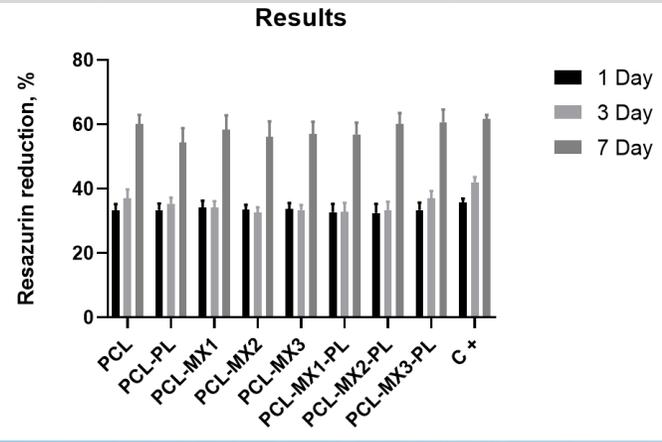
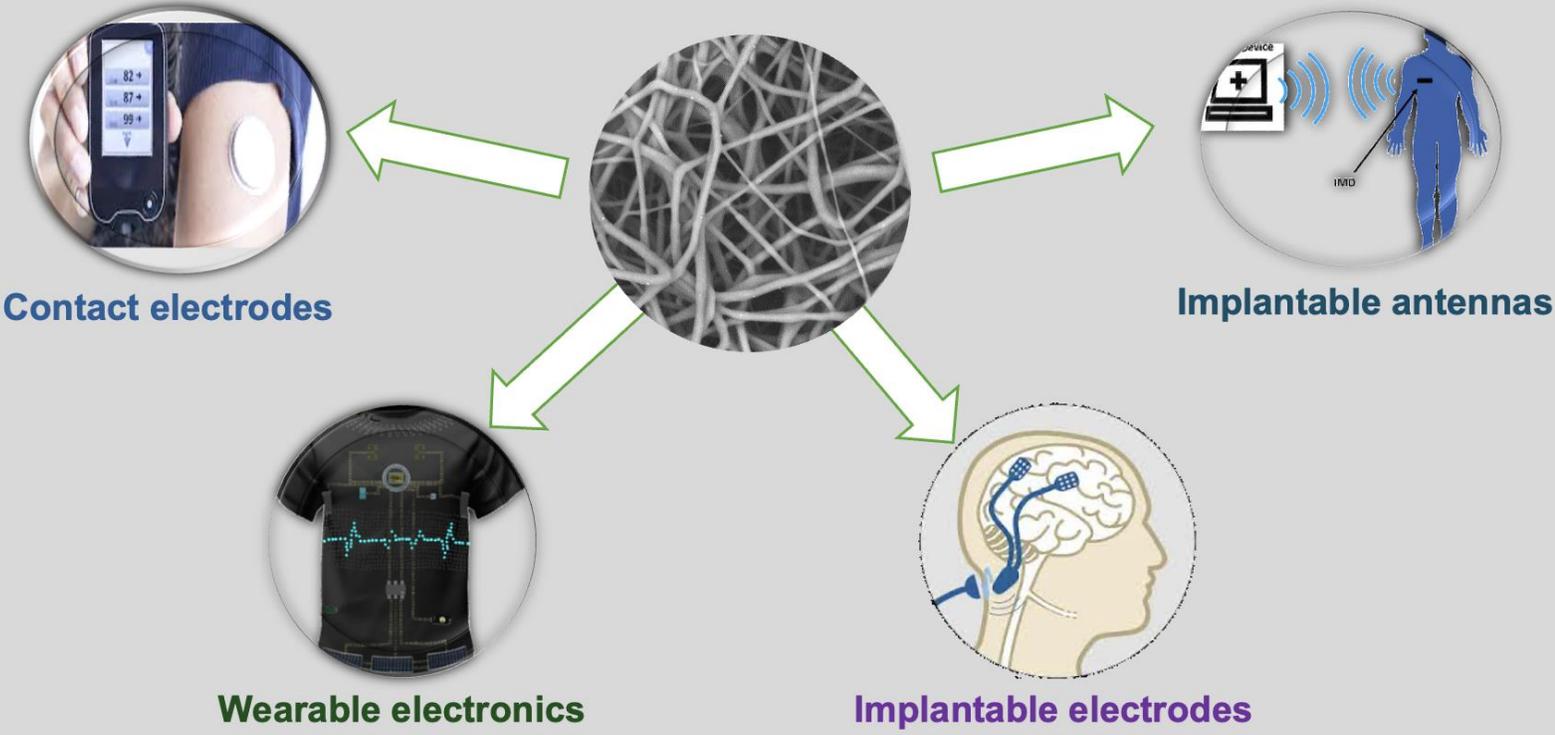
Conduction velocities for different parts of the heart:

1. **Sinoatrial (SA) Node:** Around 0.05 - 0.1 mS/m.
2. **Atria:** Approximately 0.3 - 1 mS/m.
3. **Atrioventricular (AV) Node:** Around 0.02 - 0.05 mS/m.
4. **Bundle of His:** Approximately 1 - 1.5 mS/m.
5. **Purkinje Fibers:** Roughly 2 - 4 mS/m

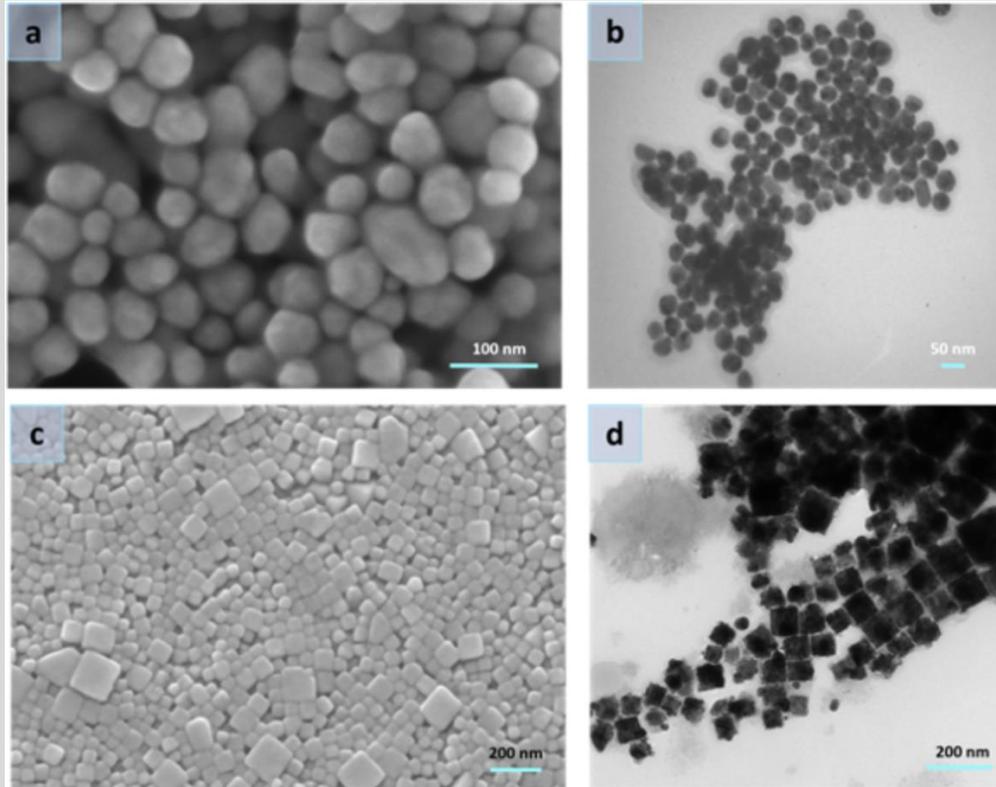
Electroconductive Scaffolds for Cardiac Tissue Engineering



Perspectives



AgNPs properties

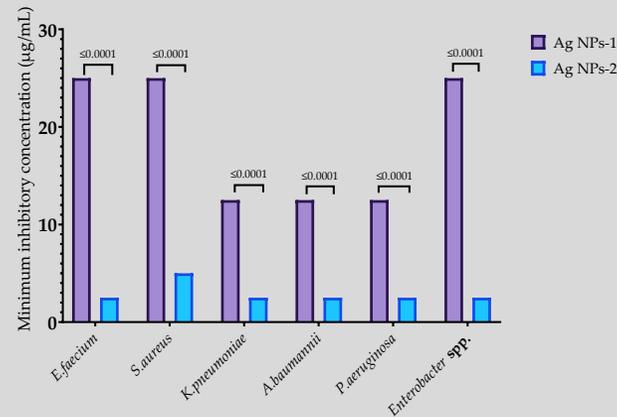


Resistance profiles of isolated microorganisms

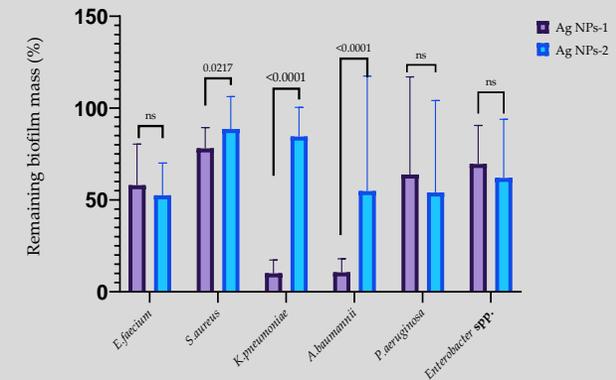
Strain	Profile of strains sensitivity to antibiotics							
	Amo	Imi	Van	Gat	Cep	Cet	Ami	Azi
<i>E.faecium</i>	R	R	S	S	R	S	S	R
<i>S.aureus</i>	R	R	R	S	R	R	R	R
<i>K.pneumoniae</i>	R	S	-	R	R	R	S	R
<i>A.baumannii</i>	R	R	-	S	R	R	S	R
<i>P.aeruginosa</i>	R	S	-	R	R	R	R	S
<i>Enterobacter spp.</i>	R	R	-	-	R	S	S	R

R- resistant, S – sensitive, Amo – amoxicillin, Imi – imipenem, Van – vancomycin, Gat- gatifloxacin, Cep – cefepime, Cet – cefotaximum, Ami – amikacin, Azi – azithromycin.

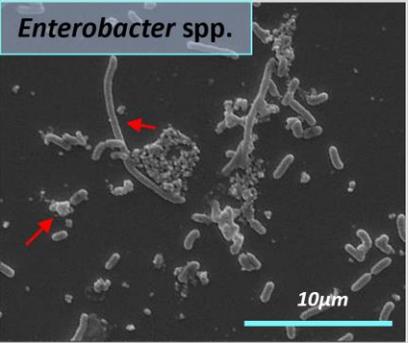
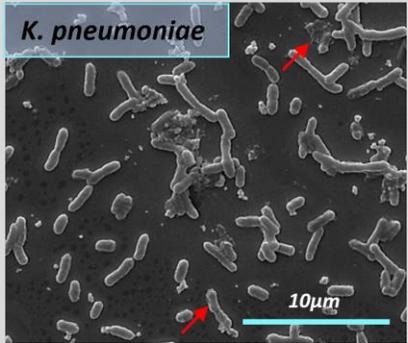
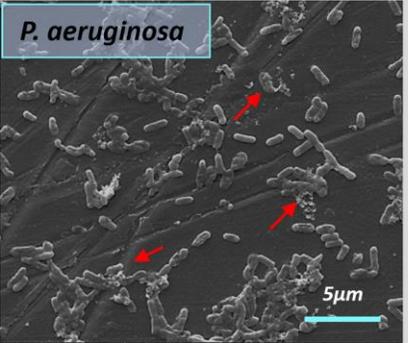
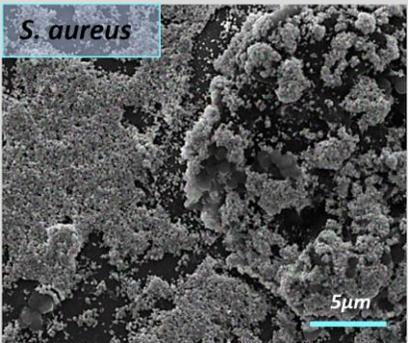
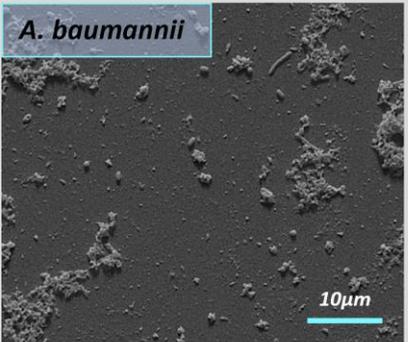
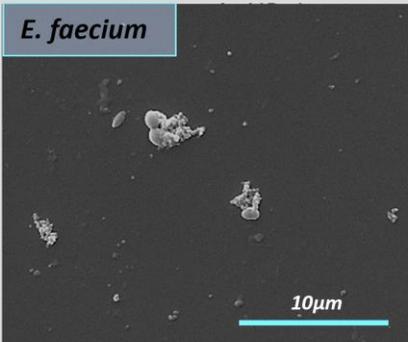
Minimum inhibitory concentration of AgNPs



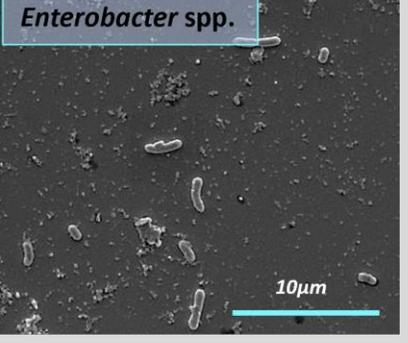
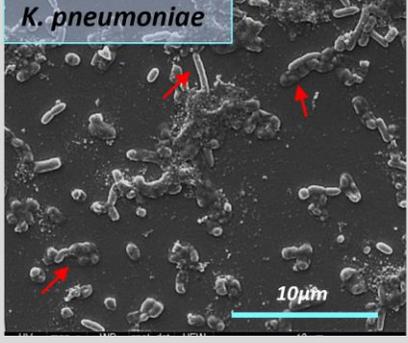
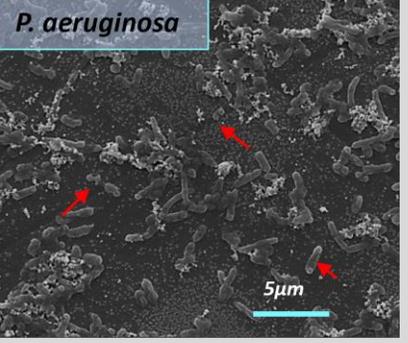
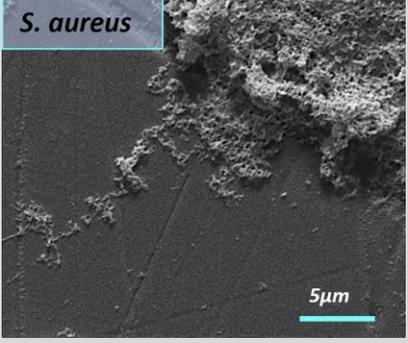
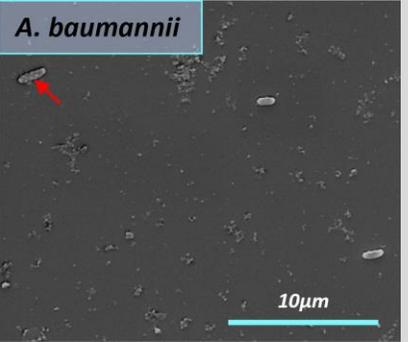
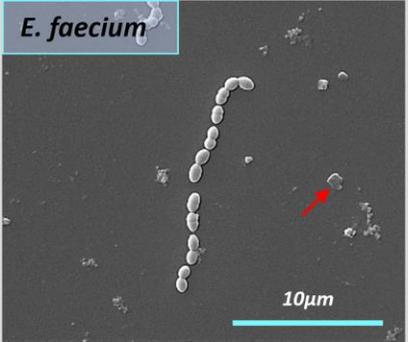
The anti-adhesion activity of AgNPs



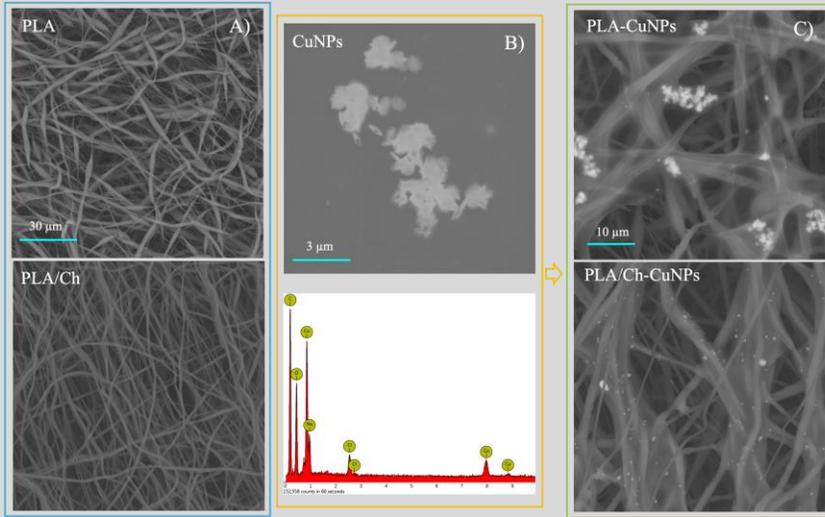
AgNPs properties



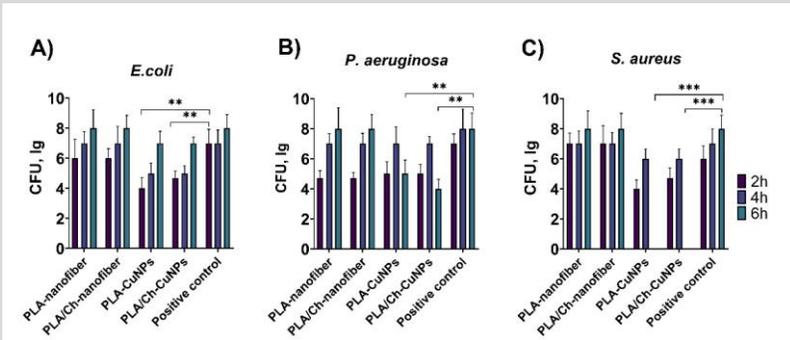
The influence of AgNPs on the structure of mature biofilms formed by ESKAPE pathogens



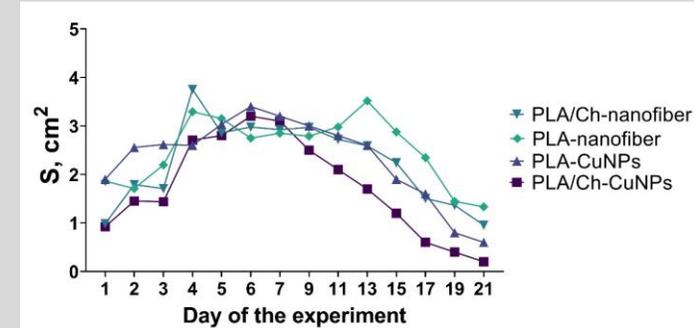
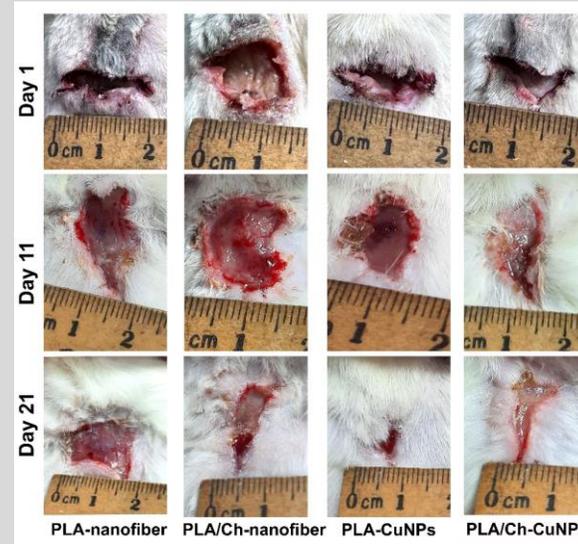
CuNPs applications



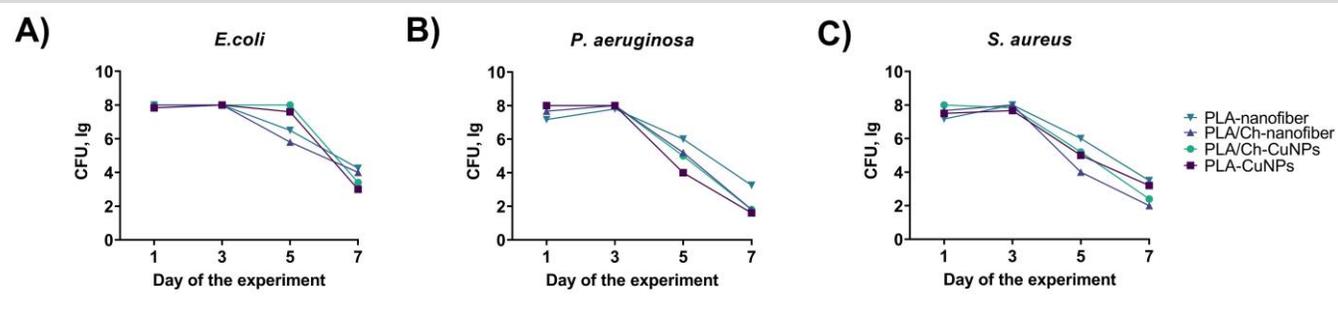
Scanning electron microscopy of as-spun PLA and PLA/Ch fibers (A) and after CuNPs deposition (B) with SEM images and EDX of CuNPs



Dynamic of bacterial growth after the incubation of different electrospun membranes

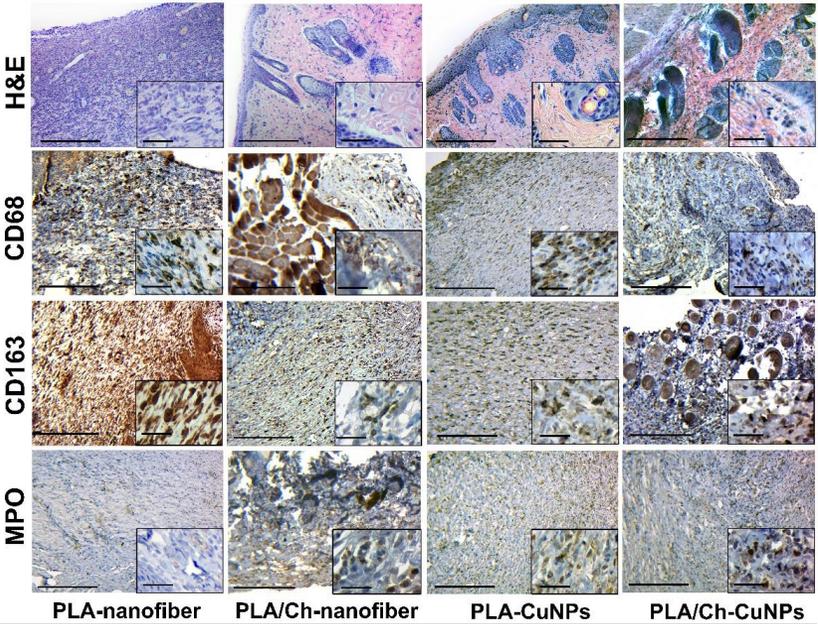
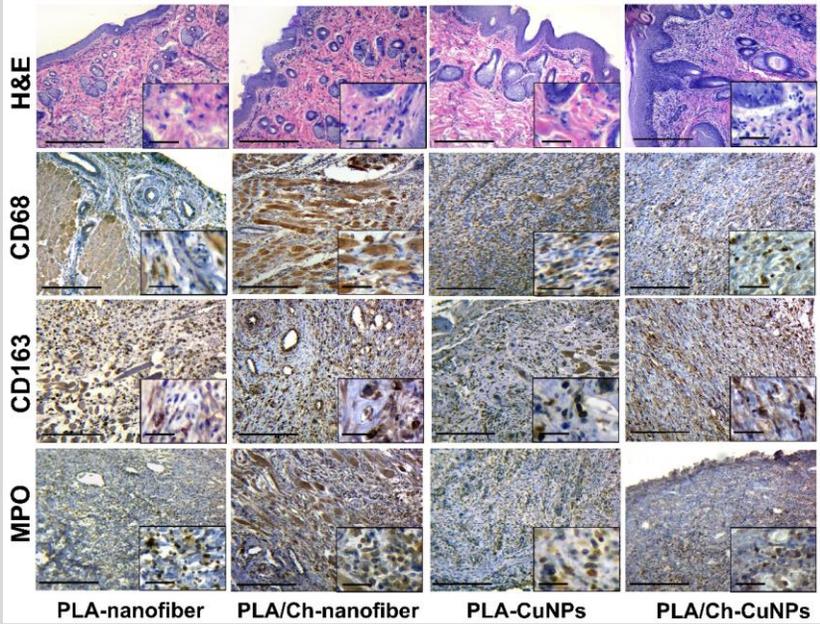
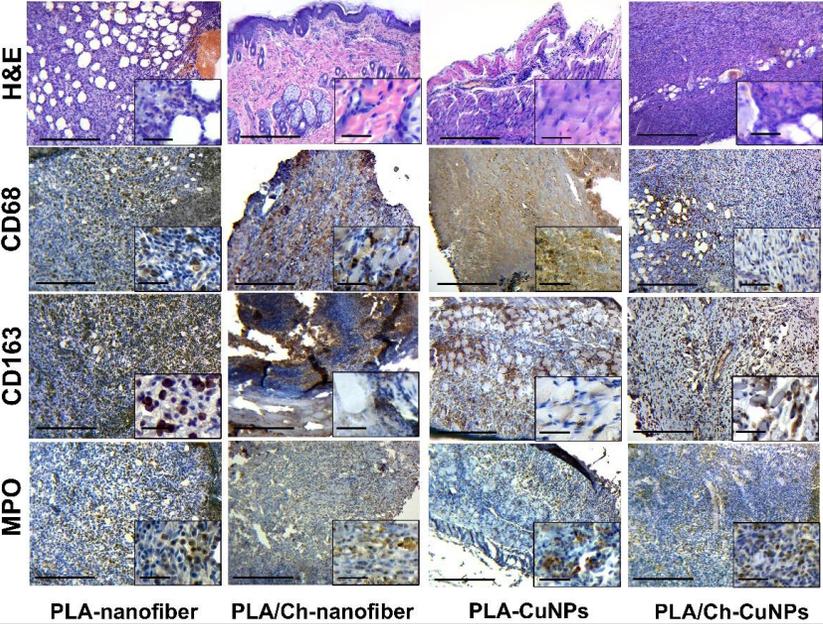


Dynamic of wound size in the laboratory animals with different treatments from day 1 to day 21 of the experiment



Microbiological composition of the wound at different time points of the experiment

CuNPs applications



H&E and immunohistochemical staining of the skin samples from the experimental group in 3, 14 and 21 days after treatment

Plans for 2025



- IPSc culturing
- Microfluidic in cell culture and bacteriology
- Organ-on-chip technology
- Cell-based bioprinting
- New analytical methods for cell culture
- Advanced electrospinning

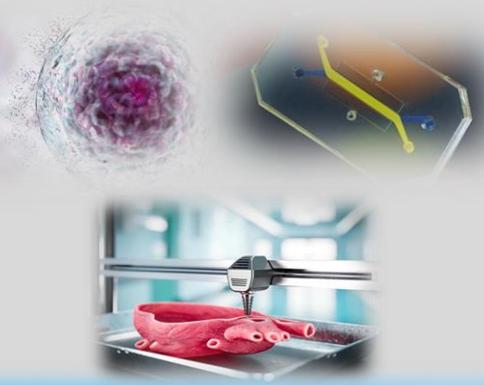


- BioPhot project
- M-Era.Net
- Horizon Europe (ERC Synergy, Twinning, etc.)
- LZP
- Etc.

Dissemination



Latvijas Zinātnes padome



Acknowledgement



**STAND WITH
UKRAINE**