Mykola Telychko, PhD

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RESEARCH EXPERIENCE

Oak Ridge National Laboratory, Center for Nanophase Materials Sciences (USA) Feb. 2024 – present

R&D Associate Staff, Scanning Tunneling Microscopy Group

National University of Singapore, Department of Chemistry (Singapore) Nov. 2021 – Feb. 2024

Senior Research Fellow

National University of Singapore, Department of Chemistry (Singapore) Dec. 2016 – Oct. 2021

Research Fellow

Institute of Physics, Academy of Science of Czech Republic Oct. 2012 – Nov. 2016

Graduate Researcher

EDUCATION

Charles University in Prague (Czech Republic) Oct. 2012 – Nov. 2016

PhD in Physics of Surfaces and Interfaces

Thesis: "Studying possibilities of graphene functionalization using AFM and STM techniques"

Supervisor: Prof. Pavel Jelinek

Uzhgorod National University, Faculty of Physics (Ukraine) Sept. 2007 – July. 2012

Department of Solid State Electronics

Master in Solid State Physics, completed with Highest Honors

PUBLICATIONS (Google Scholar, ORCID)

Selected Publications (*co-first authorship/equal contribution); **Full list at the end;**

1. **M. Telychko**, K. Noori, H. Biswas, D. Dulal, Z. Chen, P. Lyu, Jing Li, Hsin-Zon Tsai, H. Fang, Z. Qiu, Z. W. Yap, K. Watanabe, T. Taniguchi, J. Wu, K. P. Loh, M. F. Crommie, A. Rodin, J. Lu. Gate-tunable resonance state and screening effects for proton-like atomic charge in graphene, ***Nano Letters***, 22(21), 8422–8429, 2022 (link).
2. **M. Telychko,** S. Edalatmanesh, K. Leng, I. Abdelwahab, N. Guo, C. Zhang, J. I. Mendieta-Moreno, M. Nachtigall, J. Li, K. Ping Loh, P. Jelínek, J. Lu. Sub-angstrom Non-invasive Imaging of Atomic Arrangement in 2D Hybrid Perovskites, ***Science Advances***, 8, 17, eabj0395, 2022 (link, PhysOrg).
3. C. Li, **M. Telychko* (contributed equally)**, Y. Zheng, S. Yuan, Z. Wu, Walter P. D. Wong, Y. Li, Y. Jin, Weng Fu Io, X. Wang, J. Lin, J. Hao, C. Han, Kai Leng, Switchable planar chirality and spin texture in highly ordered ferroelectric hybrid perovskite domains, *Nature Communications*, 15, 10221, 2024 (link).

4. J. Li*, **M. Telychko* (contributed equally)**, J. Yin, Y. Zhu, G. Li, S. Song, H. Yang, J. Li, J. Wu, J. Lu, X. Wang. Machine vision automated chiral molecule detection and classification in molecular imaging, ***Journal of American Chemical Society***, 143, 27, 10177–10188, 2021 (link)

5. **M. Telychko**, G. Li, P. Mutombo, D. Soler-Polo, X. Peng, J. Su, S. Song, M. Joo Koh, M. Edmonds, P. Jelinek, J. Wu, J. Lu, Ultrahigh-yield on-surface synthesis and assembly of circumcoronene into a chiral electronic Kagome-honeycomb lattice, ***Science Advances***, 7 (3), 2021 (link, PhysOrg).

6. L. Zhang*, S. Zhao*, **M. Telychko* (contributed equally)**, S. Sun, X. Lian, J. Su, A. Tadich, D. Qi, J. Zhuang, Y. Zheng, Z. Ma, C. Gu, Z. Hu, Y. Du, J. Lu, Z. Li, and W Chen, Reversible Oxidation of Blue Phosphorus Monolayer on Au (111), ***Nano Letters,*** 19 (8), 5340-5346, 2019 (link).

7. **M. Telychko**, J. Su, A. Gallardo, Y. Gu, J. I. Mendieta-Moreno, D. Qi, A. Tadich, S. Song, P. Lyu, Z. Qiu, H. Fang, M. J. Koh, J. Wu, P. Jelínek, J. Lu. Strain-induced isomerization in one-dimensional metalorganic chains, ***Angewandte Chemie Int. Ed.,*** 58 (51), 18591-18597, 2019 (link).

8. J. Su*, **M. Telychko* (contributed equally)**, P. Hu*, G. Macam*, P. Mutombo, H. Zhang, Y. Bao, F. Cheng, Z.-Q. Huang, Z. Qiu, S. J. R. Tan, H. Lin, P. Jelínek, F.-C. Chuang, J. Wu, J. Lu. Atomically precise bottom-up synthesis of π-extended [5]triangulene, ***Science Advances*****,** 5 (7), 2019 (link, PhysOrg).

9. K. Leng, I. Abdelwahab, I. Verzhbitskiy**, M. Telychko**, L. Chu, W. Fu, X. Chi, N. Guo, Z. Chen, Z. Chen, C. Zhang, Q. H. Xu, J. Lu, M. Chhowalla, G. Eda, K. P. Loh. Molecularly Thin Two-dimensional Hybrid Perovskites with Tunable Optoelectronic Properties due to Reversible Surface Relaxation, ***Nature Materials***, 17 (10), 908, 2018 (link, PhysOrg).

10. **M. Telychko**, P. Mutombo, P. Merino, P. Hapala, M. Ondráček, F. C. Bocquet, J. Sforzini, O. Stetsovych, M. Vondráček, P. Jelínek, M. Švec. Electronic and chemical properties of donor, acceptor centers in graphene", ***ACS Nano***, 9(9):9180–9187, 2015 (link).

11. **M. Telychko**, P. Mutombo, M. Ondráček P. Hapala, F. C. Bocquet, J. Kolorenč, M. Vondráček, P. Jelínek, M. Švec. Achieving high-quality single-atom nitrogen doping of graphene/SiC(0001) by ion implantation and subsequent thermal stabilization", ***ACS Nano***, 8(7):7318–7324, 2014 (link).

RESEARCH GRANTS

A*STAR Advanced Manufacturing and Engineering, Nov. 2020 – Nov. 2023
Young Individual Research Grant (Singapore)**.**
Title: "Atomically precise graphene quantum dots for single photon quantum emission" (Project No: A20E6c0098; link grant scheme).
Role: principal Investigator*;* Total budget: ~**230,000** USD.

CONFERENCE CONTRIBUTIONS

Oral presentations

1. "Sub-angstrom noninvasive imaging of atomic arrangement in 2D hybrid perovskites", 23rd International Conference on Non-contact Atomic Force Microscopy, Nijmegen/Netherlands, **talk** (August 2022)

2. "Atomically precise bottom-up synthesis of π-extended [5]triangulene", IBS Conference of Quantum Nanoscience, Seoul/Korea, **talk** (Sept. 2019)

3. "Real-space imaging of strain-induced isomerization of 1D metal-organic chains" ICMAT 2019, 10 International Conference on materials and advanced technologies, Singapore, **invited talk** (June 2019).

4. Destructive interference towards chemical discrimination of N and B dopants in the B,N co-doped graphene/SiC(0001)", ECOSS-2015, Barcelona/Spain, **talk** (Sept. 2015)
5. "Quantum interference on the doped graphene/SiC systems", DPG conference, Berlin/Germany, **talk** (March 2015)
6. "Single atom B and N co- doping of graphene /SiC(0001)" ECOSS-2014, Turkey/Antalya, **talk** (Sept. 2014)
7. "High-quality single atom N-doping of graphene/SiC(0001) by ion implantation" DPG, Drezden/Germany, **talk** (April 2014)

Poster presentations

1. "Probe charge and screening effect for a single N-dopant in a gated graphene/BN device", Electronic Structure and Processes at Molecular –Based Interfaces" (ESPMI9), National University of Singapore, **poster** (Nov. 2017).
2. "Achieving high quality single atom N-doping of graphene/SiC(0001) by ion implantation and subsequent thermal stabilization INS Summer School "New Frontiers in Scanning Force Microscopy", Madrid/Spain, **poster** presentation, **poster** (June 2014)
3. "nc-AFM/STM and DFT study of the B:Si(111) surface" WE-Herereus-Seminar "Interactions with the Nanoworld: Local Probes with Time, Energy and Force resolution", Bad Honnef/ Germany, **poster** (Nov. 2013)

TECHNICAL SKILLS

Laboratory skills: Operation and maintenance of a low-temperature SPM setup; MBE and CVD materials growth; e-beam deposition; 2D material exfoliation and device fabrication; synchrotron-based XPS/NEXAFS; PL; AFM; Raman; design of ultra-high vacuum equipment; UHV ion implantation; data acquisition and instrument control via Labview &Python

Programming languages: Proficient in Python, Labview, Matlab, LaTex; Familiar with: C++;

PUBLICATIONS (continued)

12. Z. Qiu, Y. Han, K. Noori, Z. Chen, M. Kashchenko, L. Lin, T. Olsen, J. Li, H. Fang, P. Lyu, **M. Telychko**, X. Gu, S. Adam, S. Y. Quek, A. Rodin, A. Castro Neto, K. S Novoselov, J. Lu. Evidence for electron–hole crystals in a Mott insulator, *Nature Materials*, 2024 (link)
13. S. Song, A. P. Solé, A. Matěj, G. Li, O. Stetsovych, D. Soler, H. Yang, **M. Telychko**, J. Li, M. Kumar, J. Brabec, L. Veis, J. Wu, P. Jelinek, J. Lu. Highly-Entangled Polyradical Nanographene with Coexisting Strong Correlation and Topological Frustration, *Nature Chemistry*, 2023 (link)
14. F. Cao, D. Yu, **M. Telychko**, J. Lu, P. Pang, C. Su, G. Xing. Navigating the Site-Distinct Energy Conversion Properties of Perovskite Quantum Wells, *ACS Energy Letters*, 8, 2, 1236–1265, 2023 (link)
15. J. Li, **M. Telychko* (contributed equally)**, L. Zhou, Z. Chen, X. Peng, W. Ji, J. Lu, and K. P. Loh. Sub-Angstrom Imaging of Nondegenerate Kekule Structures in a Two-Dimensional Halogen-Bonded Supramolecular Network, *Journal of Phys. Chem. C*, 126, 8, 4241–4247, 2022 (link).

16. **M. Telychko**, L. Wang, C.-H. Hsu, G. Li, X. Peng, S. Song, J. Su, F.-C. Chuang, J. Wu, M. W. Wong, Jiong Lu. Tailoring long-range superlattice chirality in the molecular self-assemblies via weak fluorine-mediated interactions, *Phys. Chem. Chem. Phys.*, 23, 21489-21495, 2021 (link).

17. H. Fang, A. Gallardo, D. Dulal, Z. Qiu, J. Su, **M. Telychko**, H. Mahalingam, P. Lyu, Y. Han, Y. Zheng, Y. Cai, A. Rodin, P. Jelinek, J. Lu. Electronic Self-Passivation of Single Vacancy in Black Phosphorus via Ionization, *Phys. Rev. Lett*., 12 (35), 11659-11667, 2021 (link)

18. S. Song, L. Wang, J. Su, Z. Xu, C.-H. Hsu, C. Hua, P. Lyu, J. Li, X. Peng, T. Kojima,S. Nobusue, **M. Telychko**, Y. Zheng, F.-C. Chuang, H. Sakaguchi, M. Wah Wong, J. Lu, Manifold dynamic non-covalent interactions for steering molecular assembly and cyclization, *Chemical Science*, 12 (35), 11659-11667, 2021 (link)

19. X. Peng, H. Mahalingam, S. Dong, P. Mutombo , J. Su, **M. Telychko**, S. Song, P. Lyu, P. W. Ng, J. Wu, P. Jelínek, C. Chi, A. Rodin, J. Lu. Visualizing designer quantum states in stable macrocycle quantum corrals, Nature communications 12 (1), 1-9, 2021 (link)

20. S. Song, J. Su, X. Peng, X. Wu, **M. Telychko***. Recent Advances in Bond-resolved Scanning Tunnelling Microscopy, Surface Review and Letters 28, 08, 2021 (link)

21. S. Song, J. Su, **M. Telychko**, J. Li, G. Li, Y. Li, C. Su, J. Wu, J. Lu. "On-surface synthesis of graphene nanostructures with π -magnetism", *Chemical Society Reviews*, 50, 3238-3262, 2021 (link)

22. J. Su, W. Fan, P. Mutombo, X. Peng, S. Song, M. Ondracek, P. Golub, J. Brabec, L. Veis, **M. Telychko**, P. Jelinek, J. Wu, J. Lu, On-Surface Synthesis and Characterization of [7] Triangulene quantum Ring, *Nano Letters*, 21, 1, 861–867, 2021 (link)

23. S. Song, N. Guo, X. Li, G. Li, Y. Haketa, M. Telychko, J. Su, P. Lyu, Z. Qiu, H. Fang, X. Peng, J. Li, X. Wu, Y. Li, C. Su, M. J. Koh, J. Wu, H. Maeda, C. Zhang, Jiong Lu. Real-Space Imaging of a Single-Molecule Monoradical Reaction. *Journal of the American Chemical Society* 142 (31), 13550-13557, 2020 (link)

24. J. L. Z., S. Zhao, S. Sun, H. Ding, J. Hu, Y. Li, Q. Xu, X. Yu, **M. Telychko**, J. Su, C. Gu, Y. Zheng, X. Lian, Z. Ma, R. Guo, J. Lu, Z. Sun, J. Zhu, Z. Li, W. Chen. Synthesis of monolayer blue phosphorus enabled by silicon intercalation, *ACS nano*, 14 (3), 3687-3695, 2020 (link)

25. J. Su, X. Wu, S. Song, **M. Telychko***, Jiong Lu*, Substrate induced strain for on-surface transformation and synthesis, *Nanoscale*, 12, 7500 – 7508, 2020 (link)

26. J. Su, **M. Telychko**, S. Song, J. Lu "Triangulene series: from precursor design towards on-surface synthesis and characterization", *Angewandte Chemie*, 59 (20), 7658-7668, 2020 (link)

27. Z. Qiu, M. Trushin, H. Fang, I. Verzhbitskiy, S. Gao, E. Laksono, M. Yang, P. Lyu, J. Li, J. Su, **M. Telychko**, K. Watanabe, T. Taniguchi, J. Wu, AH Castro Neto, L. Yang, G.Eda, S. Adam, J. Lu, Giant gate-tunable bandgap renormalization and excitonic effects in a 2D semiconductor, *Science advances*, 5 (7), eaaw2347, 2019 (link)

28. **M. Telychko**, J. Lu, "Recent advances in atomic imaging of organic-inorganic hybrid perovskites" *Nano Materials Science*, 1, 4, 260-267, 2019 (link)

29. J. Redondo, **M. Telychko**, P. Prochazka, M. Konecny, J. Berger, M. Vondracek, J. Cechal, P. Jelinek, M. Svec "Simple device for the growth of micrometer-sized monocrystalline single-layer graphene on SiC (0001)", *Journal of Vacuum Science and Technology A*, 36, 031401, 2018 (link).

30. Z. Qiu, H. Fang, A. Carvalho, A. S. Rodin, Y. Liu, S. J. R. Tan, **M. Telychko**, P. Lv, J. Su, Y. Wang, A. Castro Neto, J. Lu. Resolving the spatial structures of bound hole states in black phosphorus. *Nano Lett*., 17 (11), pp 6935–6940, 2017 (link).

31. J. Sforzini, **M. Telychko**, O. Krejčí, M. Vondráček, M. Švec, F. C. Bocquet, and F. S. Tautz. Transformation of metallic boron into substitutional dopants in graphene on 6H-SiC(0001)", *Physical Review B*. 93, 041302, 2016 (link)

32. **M. Telychko**, Jan Berger, Zsolt Majzik, Pavel Jelínek,Martin Švec, Graphene on SiC(0001) inspected by dynamic atomic force microscopy at room temperature. *Beilstein Journal of Nanotechnology*, 6:901–906, 2015 (link)

33. E. J. Spadafora, J. Berger, P. Mutombo, **M. Telychko**, M. Svec, Z. Majzik, A. B. McLean and P. Jelinek. Identification of Surface Defects and Subsurface Dopants in a Delta-Doped System Using Simultaneous nc-AFM/STM and DFT. *Journal of Physical Chemistry C*, 118 (29), pp 15744–15753, 2014 (link)