

KATARZYNA SADECKA

+48 508 378 370 (PL)

katarzyna.sadecka@pwr.edu.pl | sadkat27@gmail.com

AREA OF INTEREST AND EXPERTISE

Electronic and optical properties of correlated electrons in 2D crystals, focusing on mono- and bilayers of transition metal dichalcogenides and graphene. Magnetic field effects on the excitonic properties of 2D crystals. Optical response of 2D heterostructures towards single photon emitter applications. Electronic structure of 2D heterostructures towards quantum computing applications, focusing on Q -valley-based qutrits. Topological effects manifesting in the excitonic spectrum of 2D materials. Computational methods of density functional theory.

EDUCATION

PhD studies Physical Sciences <i>Optical properties of correlated electrons in two-dimensional crystals</i> Supervisors: Prof. Arkadiusz Wójs, Prof. Paweł Hawrylak Wrocław University of Science and Technology, University of Ottawa	currently
Master's degree Physical Sciences <i>Optical response of bilayer transition metal dichalcogenides</i> Supervisor: Prof. Arkadiusz Wójs Wrocław University of Science and Technology	July 2021 Wrocław, Poland
Engineer's degree Physical Sciences <i>Construction of tight-binding models for 2D semiconductor crystals</i> Supervisor: Prof. Arkadiusz Wójs Wrocław University of Science and Technology	February 2019 Wrocław, Poland

PUBLICATIONS

- K. Sadecka**, Y. Saleem, D. Miravet, M. Albert, M. Korkusiński, G. Bester, P. Hawrylak, **Phys. Rev. B** **109**, 085434 (2024)
"Electrically tunable fine structure of negatively charged excitons in gated bilayer graphene quantum dots"
- Y. Saleem, **K. Sadecka**, M. Korkusiński, P. Hawrylak, **Nano Letters** **23**, 2998-3004 (2023)
"Excitons in Gated Bilayer Graphene Quantum Dots"
- M. Bieniek, **K. Sadecka**, L. Szulakowska, P. Hawrylak, **Nanomaterials** **12**, 9, 1582 (2022)
"Theory of excitons in atomically thin semiconductors: tight-binding approach"
- K. Sadecka**, **Acta Physica Polonica A** **141**, 2 (2022)
"Inter- and Intralayer Excitonic Spectrum of MoSe₂/WSe₂ Heterostructure"
- M. J. Winiarski, K. Kozieł, **K. Sadecka**, P. J. Dereń, **Solid State Communications** **314**, 113936 (2020)
"The substitution effects on electronic structure of Ba₂MgWO₆ double perovskite oxide"

SKILLS

- Programming:** Fortran (advanced), MATLAB (advanced), Python (basic), C++ (basic), Bash (basic)
Experience in using computer clusters | the job scheduler: Slurm and PBS
Knowledge of computational methods of density functional theory | Abinit (advanced), VASP (basic)
Experience in the field of condensed matter physics, in particular:
- tight-binding approximation, k - p methods and Bethe-Salpeter theory,
 - excitons and trions in monolayers of semiconductor transition metal dichalcogenides (tight binding models for solving the Bethe-Salpeter equation and predicting the exciton fine structure),
 - optical response of transition metal dichalcogenide bilayers (studies from the point of view of electronic, excitonic and topological properties),
 - excitonic properties of bilayer graphene quantum dots (predicting the exciton fine structure using the Bethe-Salpeter equation),

Graphing and Analysis: OriginLab, Gnuplot

Document Creation: LaTeX, Microsoft Office

Languages: Polish (native), English (professional working proficiency), German (limited working proficiency)

SCIENTIFIC COLLABORATION

International Internships, Canada

March; May – June; August – December 2022
October – December 2021

Quantum Theory Group, University of Ottawa, Canada

International Scientific Visit, Germany

December 2021

Institut für Theoretische Physik und Astrophysik, Universität Würzburg, Germany

SELECTED CONFERENCES AND PRESENTATIONS

Gate-Tunable Valley Qubits in TMD Heterostructure Quantum Dots (Poster) March 2024
12th International Conference on Quantum Dots, QD2024

Electrically Tunable Excitons in Gated Bilayer Graphene Quantum Dots July 2023
EP2DS-25 and MSS-21

Electrical Control of Interlayer Physics in Type-II TMD Heterostructures (Poster) June 2023
51st International School & Conference on the Physics of Semiconductors "Jaszowiec 2023"

Fine Structure of Excitons in TMD Type-II Heterostructures May 2022
2022 CAP Congress

Fine Structure of Excitons in TMD Type-II Heterostructures (Poster) June 2022
International Workshop on Quantum Circuits in 2D Materials 2022

Electronic Properties and Inter- and Intralayer Excitons in MoSe₂/WSe₂ Heterostructure March 2022
APS March Meeting 2022

Excitons in Transition Metal Dichalcogenide Heterostructures (Poster) September 2021
49th International School & Conference on the Physics of Semiconductors "Jaszowiec 2021"

Ab Initio-based Tight-Binding Models for Excitons in 2D Semiconductor TMD Crystals October 2020
Phobia Annual Nanophotonics International Conference PANIC

Tight-Binding Models Construction for 2D Semiconductor Crystals (Poster, PL) September 2019
45th Congress of Polish Physicists

HONORS AND AWARDS

PRIMUS Award for Doctoral Students August 2023
Wrocław University of Science and Technology

Dean's Award for Scientific Achievements November 2022
Wrocław University of Science and Technology

Attendance in International Summer School on HPC Challenges in Computational Sciences 19 – 24 June 2022
GRNET and Partnership for Advanced Computing in Europe (PRACE)

Scholarship of the Rector of the Wrocław University of Science and Technology 2018 – 2021
Wrocław University of Science and Technology

Scholarship for Academic Performance from Own Fund for Scholarships May 2021
from Wrocław University of Science and Technology July 2020

Wrocław University of Science and Technology

Diploma of completion of first- and second-level studies with the grade: Excellent February 2020
Wrocław University of Science and Technology July 2021