

CURRICULUM VITAE – KRZYSZTOF SAWICKI

PERSONAL INFORMATION

Research Fellow,
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My research delves into the intersection of photonics and condensed matter physics, primarily focusing on experimental studies of polariton condensation, polariton lasing in both single and coupled microcavities, dynamics of exciton-polaritons, and investigation of single magnetic dopants in self-assembled quantum dots.

SKILLS

Research expertise: Spectroscopy of microcavity systems: single planar microcavities, micropillar microcavities, vertical coupled planar microcavities, polariton lattices and graphs in planar microcavities;
Experimental methods: magnetospectroscopy, photoluminescence, micro-photoluminescence, photoluminescence excitation, interferometry, reflectivity, transmission, time-resolved spectroscopy (streak camera), microscopy (scanning electron microscopy, focused ion beam), cryogenics, pulsed and cw lasers;
Technology: photolithography (spin coating, photoresists), hydrothermal method of nanorods and nanopowders synthesis, wet chemical synthesis of colloidal quantum dots by reverse micelle method; growth of the semiconductor layers by Atomic Layer Deposition; Deposition of dielectric layers by e-beam evaporation.

Simulation of physical effects: Nonlinear optical effects (Gross–Pitaevskii equation), Propagation of electromagnetic waves in dielectric media (Transfer matrix method, FDTD and FEM method).

Scientific software: Matlab, Mathematica, Origin.

Programming languages: Python, Scheme (MEEP).

Teaching experience: teaching undergraduates, conducting workshops for high school students

WORK EXPERIENCE

Research Fellow at the University of Southampton, Southampton *March 2022 - present*
- quantum speed-up of polariton simulators in realising the ground state of the XY Hamiltonian,
- magnetic properties of trapped polariton condensates.

INTERNSHIPS AND COURSES

Internship University of Lille, *January 2020 - July 2020*
Villeneuve d'Ascq (France), Advisor: dr. Alberto Amo
- Experimental studies of localization of light and nonlinear effects in photonic graphene
- Simulations of linear and nonlinear effects in honeycomb lattices

Internship Institute of Optoelectronics, Military University of Technology, *April 2013 - September 2013*
Warsaw (Poland), Advisor: dr Piotr Nyga
- Investigation of the effect of laser radiation on plasmonic microstructures produced by e-beam evaporation method

Internship Institute of Physics Polish Academy of Sciences, *July 2011 - October 2011*
Warsaw (Poland), Advisor: prof. Marek Godlewski
- Growth and spectroscopy of the ZnO nano- and microrods produced by hydrothermal and Atomic Layer Deposition method

Course Erasmus Intensive Program, *July 2014*
Spintronics and Applications, Chania, Greece

SCIENTIFIC PROJECTS	<p>Principle Investigator at project PRELUDIUM January 2018 - January 2022 <i>Spectroscopy studies of a microcavity exciton-polaritons flow in II-VI semiconductors</i> Project financed by National Science Centre (Poland), 178 800 PLN (39 324.04 EUR)</p> <p>Principle Investigator at project ETIUDA October 2019 - September 2020 <i>Lasing from a single and coupled double polariton microcavities made of telurides and selenides</i> Project financed by National Science Centre (Poland), 140 304 PLN (30 857,49 EUR)</p>
EDUCATION	<p>Ph.D. (with honors), Physics October 2014 - September 2021 Faculty of Physics, University of Warsaw PhD thesis: <i>Lasing from a single and coupled double polariton microcavities made of telurides and selenides</i>, Supervisor: dr. hab. Jan Suffczyński</p> <p>M.Sc., Engineering of nanostructures October 2012 - September 2014 Faculty of Physics, Faculty of Chemistry, University of Warsaw Master thesis: <i>Spectroscopy of (Cd, Mn)Te/ZnTe quantum dots marked by photolithographic 'in situ' method</i>, Supervisor: dr. hab. Jan Suffczyński</p> <p>B.Sc., Engineering of nanostructures October 2009 - September 2012 Faculty of Physics, Faculty of Chemistry, University of Warsaw Bachelor thesis: <i>Investigation of ZnO nanostructures obtained by hydrothermal method</i> Supervisors: dr. hab. Jan Suffczyński, prof. dr hab. Marek Godlewski (in cooperation with Institute of Physics, Polish Academy of Sciences)</p>
AWARDS	<ul style="list-style-type: none"> • Best Poster Award, Award Committee of 49th International School & Conference on the Physics of Semiconductors "Jaszowiec"2021 in recognition of outstanding presentation entitled <i>Bose-Einstein condensation of exciton-polaritons triggered by magnetic field in coupled planar microcavities</i> • Best Poster Award, Award Committee of 48th International School & Conference on the Physics of Semiconductors "Jaszowiec"2019 in recognition of outstanding presentation entitled <i>Polariton dynamics in double coupled microcavities</i> • The Dean's of the Faculty of Physics, University of Warsaw distinction for the outstanding conducting of course <i>Laboratory of Measurement Techniques</i> in the academic year 2016/2017. • The Dean's of the Faculty of Physics, University of Warsaw distinction for the outstanding lecture demonstrations <i>Basic Physics I</i> conducted in the academic year 2013/2014. • The Joanna and Jerzy Glazer Memorial Prize for the best Master's Thesis carried out on the Faculty of Physics at the University of Warsaw in the academic year 2013/2014.
PUBLICATIONS	<p>K. Sawicki, D. Dovzhenko, Y. Wang, T. Cookson, H. Sigurðsson, P. G. Lagoudakis <i>Occupancy-driven Zeeman suppression and inversion in trapped polariton condensates</i> <i>Physical Review B</i>, 109, 125307 (2024).</p> <p>O. Jamadi, B. Real, K. Sawicki, A. González-Tudela, N. Pernet, I. Sagnes, M. Morassi, A. Lemaître, L. Le Gratiet, A. Harouri, S. Ravets, J. Bloch, A. Amo <i>Reconfigurable photon localization by coherent drive and dissipation in photonic lattices</i> <i>Optica</i>, 9 706-712 (2022).</p> <p>M. Marciniak, T.-S. Chang, T.-Ch. Lu, F. Hjort, Å. Haglund, Ł. Marona, M. Gramala, P. Modrzyński, R. Kudrawiec, K. Sawicki, R. Bożek, W. Pacuski, J. Suffczyński, M. Gębski, A. Broda, J. Muszalski, J. A. Lott, T. Czystanowski <i>Impact of stripe shape on the reflectivity of monolithic high contrast gratings</i> <i>ACS Photonics</i> 8, 11, 3173-3184 (2021).</p> <p>K. Sawicki, T. J. Sturges, M. Ściesiek, T. Kazimierczuk, K. Sobczak, A. Golnik, W. Pacuski, J. Suffczyński <i>Polariton lasing and energy-degenerate parametric scattering in non-resonantly driven coupled planar microcavities</i> <i>Nanophotonics</i> 10(9), 2421-2429 (2021).</p>

- M. Ściesiek, K. Sawicki, K. Sobczak, T. Kazimierczuk, A. Golnik, J. Suffczyński,
Long-Distance Coupling and Energy Transfer between Exciton States in Magnetically Controlled Microcavities,
Communications Materials 1, 78 (2020).
- K. Sawicki, M. Jurczak, W. Pacuski, J. Suffczyński,
Direct Interbranch Relaxation of Polaritons in a Microcavity with Embedded CdSe/(Cd,Mg)Se Quantum Wells,
Journal of Electronic Materials 49, 4531–4536 (2020).
- K. Sawicki, J.-G. Rousset, R. Rudniewski, W. Pacuski, M. Ściesiek, T. Kazimierczuk, M. Nawrocki, J. Suffczyński,
Triple threshold lasing from a photonic trap in a Te/Se-based optical microcavity,
Communications Physics 2, 38 (2019).
- W. Pacuski, J.-G. Rousset, V. Delmonte, T. Jakubczyk, K. Sobczak, J. Borysiuk, K. Sawicki, E. Janik, J. Kasprzak,
Antireflective photonic structure for coherent nonlinear spectroscopy of single magnetic quantum dots,
Crystal Growth & Design 17, 2987–2992 (2017).
- J. Papierska, A. Ciechan, P. Bogusławski, M. Boshta, M. M. Goma, E. Chikoidze, Y. Dumont, A. Drabińska, H. Przybylińska, A. Gardias, J. Szczytko, A. Twardowski, M. Tokarczyk, G. Kowalski, B. Witkowski, K. Sawicki, W. Pacuski, M. Nawrocki, J. Suffczyński,
Fe dopant in ZnO: 2+ versus 3+ valency and ion-carrier s, p-d exchange interaction,
Physical Review B 94, 224414 (2016).
- K. Gałkowski, P. Wojnar, E. Janik, J. Papierska, K. Sawicki, P. Kossacki, J. Suffczyński,
Exciton dynamics in individual semimagnetic (Zn,Mn)Te/(Zn,Mg)Te nanowires,
Journal of Applied Physics 118, 095704 (2015).
- K. Sawicki, F. K. Malinowski, K. Gałkowski, T. Jakubczyk, P. Kossacki, W. Pacuski, J. Suffczyński,
Single-color, in situ photolithography marking of individual CdTe/ZnTe quantum dots containing a single Mn²⁺ ion,
Applied Physics Letters 106, 012101 (2015).
- J. Piwowar, J. Papierska, K. Sawicki, J. Kobak, W. Pacuski, A. Golnik, P. Kossacki, J. Suffczyński,
Optical properties of CdTe QDs in proximity to a Surface,
Acta Physica Polonica A 124, 5 795-797 (2013).

CONFERENCE
PRESENTATIONS

Oral presentations:

- 12th International Conference on Spontaneous Coherence in Excitonic Systems ICSCE12,
Occupancy-driven Zeeman suppression and inversion in trapped polariton condensates
Dublin (Ireland) 2024.
- APS March Meeting 2021,
Polariton lasing in nonresonantly driven coupled planar microcavities (online conference) 2021.
- 19th International Conference on II-VI Compounds and Related Materials,
Triple threshold lasing from a photonic trap in a Te/Se-based optical microcavity
Zhengzhou (China) 2019.
- 19th International Conference on II-VI Compounds and Related Materials,
Determination of vacuum Rabi splitting of exciton-polaritons in a microcavity with CdSe/MgSe quantum wells by photoluminescence excitation
Zhengzhou (China) 2019.
- 9th International Conference on Spontaneous Coherence in Excitonic Systems ICSCE9,
Exploring full space of lasing regimes in the emission from photonic traps in Te/Se based optical microcavity embedding a single quantum well
Montreal (Canada) 2018.
- 47th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Polariton lasing from double coupled microcavities
Szczyrk (Poland) 2018.

7. 11th OPTO 2017,
Lasing from a microcavity embedding a CdSe/(Cd,Mg)Se superlattice
Warsaw (Poland) 2017.
8. 46th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Lasing from a Se-based microcavity embedding a CdSe/(Cd,Mg)Se superlattice
Szczyrk (Poland) 2017.
9. 45th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Room temperature polariton lasing in a ZnTe based microcavity containing a single CdSe/(Cd,Mg)Se quantum well
Szczyrk (Poland) 2016.
10. 44th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Towards increased extraction of the light emitted by epitaxially grown quantum dots
Wisła (Poland) 2015.

Poster presentations:

1. 49th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Bose-Einstein condensation of exciton-polaritons triggered by magnetic field in coupled planar microcavities
(online conference) 2021 (Best poster award)
2. International Conference Optics of Excitons in Confined Systems, OECS 17, 2021,
Polariton condensation and parametric scattering in non-resonantly driven coupled planar microcavities
(online conference)
3. 20th International Conference on Physics of Light-Matter Coupling in Nanostructures PLMCN2020,
Triple threshold lasing from a photonic trap in a Te/Se-based optical microcavity
(online conference)
4. 48th "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Polariton dynamics in double coupled microcavities
Szczyrk (Poland) 2019 (Best poster award)
5. 34th International Conference on the Physics of Semiconductors ICPS2018,
Lasing from a CdSe/(Cd, Mg)Se quantum well embedded into a microcavity in a strong and weak coupling regime
Montpellier (France) 2018.
6. 18th International Conference on Physics of Light-Matter Coupling in Nanostructures PLMCN18,
Lasing from a CdSe/(Cd,Mg)Se superlattice embedded in a ZnTe based microcavity
Würzburg (Germany) 2017.
7. 33rd International Conference on the Physics of Semiconductors ICPS2016,
Single-color, in situ photolithography marking of individual quantum dots
Beijing (China) 2016.
8. 17th International Conference on II-VI Compounds and Related Materials,
Marking of individual CdTe/ZnTe Quantum Dots containing a single Mn²⁺ ion using single-color, in situ photolithography technique
Paris (France) 2015.
9. 43rd "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Positioning of individual Quantum Dots using a single laser beam photolithography
Wisła (Poland) 2014.
10. 41st "Jaszowiec" International School & Conference on the Physics of Semiconductors,
Hydrothermal synthesis and optical characterization of ZnO nanorods
Krynica Zdrój (Poland) 2012.

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