

Curriculum Vitae

Personal Data:

Name: Tomasz Józef WOJTOWICZ



Date of birth: June 9th 1955

Nationality: Polish

Marital Status: Married, two children

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Citation statistics at ResearcherID : <http://www.researcherid.com/rid/A-2887-2017>

Publications: <http://www.ifpan.edu.pl/SL-3/TWojtowicz/Publication2009.pdf>

Position: Professor

Leader of the MBE group

Research Foundation MagTop –International Centre for Interfacing Magnetism and Superconductivity with Topological Matter

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www.ifpan.edu.pl/SL-3/

Also part time:

Position: Professor

Deputy Head of the Laboratory of Physics and Growth of Low Dimensional Crystals (SL3).

Head of the Group of Technology of Low Dimensional Structures (SL3.1).
Institute of Physics, Polish Academy of Sciences
02-668 Warsaw, Al. Lotników 32/46, Poland

Languages: Polish, English, Russian.

Education:

Scientific title of Professor of Physical Sciences conferred by President of Poland, October 2005

Habilitation – Solid State Physics, Institute of Physics, Polish Academy of Sciences, April 2000
Subject of the habilitation: “Excitonic and polaronic states in three- and two-dimensional structures of $\text{Cd}_{1-x}\text{Mn}_x\text{Te}$ ”.

Ph.D. – Solid State Physics, Institute of Physics, Polish Academy of Sciences, 1988,
thesis awarded by the Scientific Board of the Institute of Physics, Polish Academy of Sciences. Thesis: “The influence of the exchange interaction on the transport phenomena in $\text{Hg}_{1-x}\text{Mn}_x\text{Te}$ ”. Professor conferring a degree: Professor R.R. Gałązka

M.Sc. – Physics of Semiconductors, Department of Physics, Warsaw University, 1980,
with distinguished diploma, thesis awarded by the Polish Physical Society.
Thesis: “Far infrared magneto-optical studies of the narrow gap semiconductors”.
Supervisor: Professor M. Grynberg.

Employment history:

2012– present Professor, Deputy Head of the Laboratory of Physics and Growth of Low Dimensional Crystals (SL3) and Head of the Group of Technology of Low Dimensional Structures (SL3.1) of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

2009– 2011 Professor, Head of the Laboratory of Physics and Growth of Low Dimensional Crystals (SL3) and Head of the Group of Technology of Low Dimensional Structures (SL3.1) of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

2006– 2009 Professor, Head of SL3.1 Group of Technology of Low Dimensional Structures In the Laboratory of Physics and Growth of Low Dimensional Crystals of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

2001– 2005 Associate Professor (docent), SL3 Laboratory of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

April 2001-October 2004

Visiting Research Associate Professor and Senior Fulbright Scholar,
Department of Physics, University of Notre Dame, Notre Dame, Indiana, USA

1996 – 2003 Head of SL3.1 Group of Physics and Growth of Low Dimensional Semiconducting Crystals in the Laboratory of Physics and Growth of Low Dimensional Crystals of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

1993 – 2001 Assistant Professor (adiunkt), SL3 Laboratory of the Institute of Physics Polish Academy of Sciences, Warsaw, Poland

1991-1992 Assistant Professor (adiunkt), ON-1 Division of the Institute of Physics, Polish Academy of Sciences, Warsaw, Poland

1988-1991 Post-Doctoral Research Associate, Physics Department, University of Notre Dame, Notre Dame, Indiana, USA

1980-1987 Research Assistant, ON-1 Division of the Institute of Physics, Polish Academy of Sciences, Warsaw, Poland

Research stays abroad (longer than two weeks):

1984/85 University of Montpellier, France (together 2 months),

1988/90 University of Notre Dame, USA - (36 months long stay),

1994 Heriot-Watt University, Great Britain (1 month),

1996/99 Würzburg University, Germany (four visits, together 8 months)

2000/01 Tohoku University, Sendai, Japan – visiting professor (3 months)

2011/13 University of Notre Dame, Notre Dame, Indiana, USA - Visiting Professor (4 months)

2014/2015 – Visiting Scientist, Purdue University, West Lafayette, Indiana, USA – recipient of Sabbatical Fellowship of the Foundation for Polish Science (6 months)

Membership of Scientific Councils, Evaluating Panels and Program Committees of International Conferences and Schools:

1. Member of the Scientific Council of the Centre for Advanced Materials and Technologies CEZAMAT, 2015 – present.
2. Member of the Scientific Council of the Institute of Physics, Polish Academy of Sciences, 2006 – 2017
3. Expert of the Ministry of Science and Higher Education, Member of the panel for evaluation of applications for financing of a purchase or a production of scientific equipment (being a large infrastructure) as well as applications for financing of construction investments serving educational, scientific and R&D institutions in Poland. 2011-2014.
4. Member of the International Program Committee of the 17th International Conference on Modulated Semiconductor Structures, MSS-17, Sendai, Japan, 2015.

5. Member of the Scientific Committee of the 7th National Conference on Nanotechnology NANO 2015, Poznań, Poland, 2015.
6. Member of the Scientific Committee of the 6th National Conference on Nanotechnology NANO 2013, Szczecin, Poland, 2013.
7. Member of the International Program Committee of the 15th International Conference on II-VI Compounds, Mayan Riviera (Mexican Caribbean), Mexico, 2011.
8. Member of the Program Committee of the 40th International School and Conference on the Physics of Semiconducting Compounds, „Jaszowiec 2011“, Krynica, Poland, 2011.
9. Member of the Scientific Committee of the 5th National Conference on Nanotechnology NANO 2011, Gdańsk, Poland, 2011.
10. Member of the Program Committee of the 39th International School and Conference on the Physics of Semiconducting Compounds, „Jaszowiec 2010“, Krynica, Poland, 2010.
11. Member of the International Program Committee of the 14th International Conference on II-VI Compounds, St Petersburg, Russia, 2009.
12. Member of the Program Committee of the 38th International School and Conference on the Physics of Semiconducting Compounds, „Jaszowiec 2009“, Krynica, Poland, 2009.
13. Member of the Program Committee of the 3rd National Conference on Nanotechnology NANO 2009, Warsaw, Poland, 2009.
14. Member of the International Program Committee of the 13th International Conference on II-VI Compounds, Seoul, Korea, 2007.
15. Member of the International Program Committee of the 12th International Conference on II-VI Compounds, Warsaw, Poland, 2005.
16. Member of the Program Committee of the Electronic Materials Conference, EMC 2004, Notre Dame, USA, 2004.
17. Member of the Program Committee of the XXXII International School on the Physics of Semiconducting Compounds "Jaszowiec 2003", Jaszowiec, Poland, 2003.
18. Member of the Program Committee of the XXXI International School on the Physics of Semiconducting Compounds "Jaszowiec 2002", Jaszowiec, Poland, 2002.
19. Member of the Program Committee of the XXX International School on the Physics of Semiconducting Compounds "Jaszowiec 2001", Jaszowiec, Poland, 2001.

Graduate students advised: two graduated: dr M. Kutrowski and dr G. Cywinski, one before graduation: W. Zaleszczyk.

Activity for the promotion of science: „Nanotechnology day” - lectures and visits to labs in the Institutes of Physics PAS – yearly.

Scientific Interests:

Development of concepts and of growth technologies of novel material systems and novel devices which would bring magnetism and superconductivity into topological matter

Electrical transport (including band and hopping conductivity), localization and weak localization, metal-insulator transition in doped semiconductors.

Band structure, optical and electrical properties of narrow-gap semiconductors, including Hg-based alloys.

Spectroscopy of semiconductor thin layers, superlattices, quantum wells (including graded potential quantum wells – e.g. parabolic), quantum wires and dots.

Band structure, optical, electrical and magnetic properties of diluted magnetic semiconductors: both bulk and low-dimensional structures.

- DX centers
- Photomemory effect (persistent photoconductivity)
- Magnetic polarons
- Spin resonance of bound electrons
- Excitons and charged excitons (trions)
- Influence of free carriers (combined exciton-cyclotron resonances, band gap renormalization) on optical properties of low dimensional system
- Spin engineering

MBE growth of semiconductor nanostructures.

Physics of low-dimensional systems.

Physics of ferromagnetic semiconductors.

Main research achievements:

1. Extensive experimental studies of the “boil-off” effect and giant negative magnetoresistance in p- $\text{Hg}_{1-x}\text{Mn}_x\text{Te}$ (including its anisotropy in the hopping conductivity regime).
2. Discovery of the magnetic field induced nonmetal-metal transition in novel universality class determined by the giant spin splitting in diluted magnetic semiconductors (DMS).
3. Discovery of photomemory effect in In and Ga doped $\text{Cd}_{1-x}\text{Mn}_x\text{Te}_{1-y}\text{Se}_y$ bulk crystals and its explanation by the presence of DX centers.
4. First direct measurement of the magnetization of donor bound magnetic polarons in DMS and observation of electric dipole spin resonance allowed by magnetization fluctuations (with the use of photomemory effect).
5. Development of the MBE growth technology of the group II tellurides and diluted magnetic semiconductor quantum structures including:
 - Cubic MnTe, MgTe and $\text{Mg}_{1-x}\text{Mn}_x\text{Te}$ - nonexistent in the bulk form.
 - Quantum structures made of weakly diluted $\text{Cd}_{1-x}\text{Mn}_x\text{Te}$ ($0.7 \leq x \leq 1$).
 - Digital alloy quantum well structures.
 - Graded potential quantum wells (parabolic, half-parabolic, and triangular QWs).
 - “Wedge” quantum structure – having precisely controlled profile of the layer thickness in the direction perpendicular to the growth axis.
 - Modulation doped CdTe/CdMgTe and CdMnTe/CdMgTe quantum structures with **world record high mobility of electrons in the wide gap II-VI quantum wells**,

reaching $500\,000\text{ cm}^2/\text{Vs}$, and revealing fractional quantum Hall effect for the first time in II-VI tellurides, both nonmagnetic ([B. A. Piot, J. Kunc, M. Potemski, D. K. Maude, C. Betthausen, A. Voql, D. Weiss, G. Karczewski, and T. Wojtowicz, Phys. Rev. B **82**, 081307 \(2010\)](#)) and magnetic ([C. Betthausen, P. Giudici, A. Iankilevits, C. Preis, V. Kolkovsky, M. Wiater., G. Karczewski, B.A. Piot, J. Kunc, M. Potemski, T. Wojtowicz, D. Weiss, Phys. Rev. B \(**90**, 1153021 \(2014\)\)](#)).

- Self assembled CdTe quantum dots on ZnTe substrates (grown via Stranski-Krastanov growth mode), including QDs containing single Mn ions.
 - Nanowires (NWs) and nanowire heterostructures (core-shell and axial, e.g. QDs in NWs) grown by gold assisted vapour-liquid-growth (VLS) mechanism, growth of the **first $\text{Zn}_{1-x}\text{Mn}_x\text{Te}$ DMS NWs** ([W. Zaleszczyk, E. Janik, A. Presz, P. Dłużewski, S. Kret, W. Szuszkiewicz, J.F. Morhange, E. Dynowska, H. Kirmse, W. Neumann, A. Petrouchik, L.T. Baczewski, G. Karczewski, T. Wojtowicz, Nano Letters **8**, 4061 \(2008\)](#)).
 - Development of MBE technology for the growth of III-Mn-V ferromagnetic semiconductors and their nanostructures, including the first growth of **ferromagnetic $\text{In}_{1-x}\text{Mn}_x\text{Sb}$** ([T. Wojtowicz, G. Cywinski, W. L. Lim, X. Liu, M. Dobrowolska, J. K. Furdyna, K. M. Yu, W. Walukiewicz, G. B. Kim, M. Cheon, X. Chen, S. M. Wang, and H. Luo, Applied Physics Letters **82**, 4310 \(2003\)](#)) and **ferromagnetic GaAs/Ga_{1-x}Mn_xAs core-shell nanowires** ([A. Rudolph, M. Soda, M. Kiessling, T. Wojtowicz, D. Schuh, W. Wegscheider, J. Zweck, C. Back, E. Reiger, Nano Letters **9**, 3860 \(2009\)](#)).
6. Observation and unambiguous identification of negatively charged excitons X^- in diluted magnetic semiconductor quantum wells.
 7. Demonstration of the various methods of spin splitting engineering possible in DMS quantum structures (graded distribution of magnetic component, heating of Mn ions via free carriers, modification of the exchange parameters with the well width).
 8. Application of the spin splitting engineering for the studies of g-factor dependence of the evolution of optical properties of quantum well with the increase of 2DEG concentration. First observation of the nonmonotonic dependence of X^- line intensity vs. magnetic field caused by the reversal of the ordering of electron spin sublevels.
 9. Studies of excitons in parabolic quantum wells and determination of the valence band offsets in CdTe/MnTe and CdTe/MgTe systems.
 10. Studies of the effect of low temperature annealing on the electrical and magnetic properties of GaMnAs showing that the increase of Curie temperature is related to the rearrangement of Mn atoms in the lattice. Identification of the thermodynamical limit of the free hole concentration and hence the limitation for the Curie temperature (the paper by [K. M. Yu, W. Walukiewicz, T. Wojtowicz, J. Kuryliszyn, X. Liu, Y. Sasaki, and J. K. Furdyna, Physical Review B **65**, 201303\(R\) \(2002\)](#)) was cited already over 440 times).
 11. Studies of the effect of Be co-doping on the magnetic properties of ferromagnetic GaMnAs and identification of the mechanism of the observed decrease of Curie temperature caused by the co-doping.
 12. The first studies of the Be modulation doped GaMnAs QWs proving that Mn substitutional incorporation is determined by Fermi energy position during the growth ([T. Wojtowicz, W.](#)

[L. Lim, X. Liu, M. Dobrowolska, J. K. Furdyna, K. M. Yu, W. Walukiewicz, I. Vurgaftman, and J. R. Meyer, *Applied Physics Letters* **83**, 4220 \(2003\)](#)).

13. Experimental demonstration, together with the group of Prof. D. Weiss from University of Regensburg, of a **new type of spin transistor** based upon a high mobility two-dimensional electron gas localized inside a CdMnTe quantum well ([C. Betthausen, T. Dollinger, H. Saarikoski, V. Kolkovsky, G. Karczewski, T. Wojtowicz, K. Richter, D. Weiss, *Science* **337**, 324 \(2012\)](#)). This new and efficient design uses adiabatic spin propagation to protect spin information, along with tunable non-adiabatic Landau-Zener transitions between spin eigenstates for spin-transmission control. In contrast to other spin-transistor designs, this adiabatic spin transistor is quite tolerant against disorder caused by material imperfections. This is a major step toward practical implementation of spin-based semiconductor devices.
14. Clear demonstration of THz radiation from spin-waves excited in DMS via efficient Raman generation process (together with group from Paris: [R. Rungsawang, F. Perez, D. Oustinov, J. Gómez, V. Kolkovsky, G. Karczewski, T. Wojtowicz, J. Madéo, N. Jukam, S. Dhillon, and J. Tignon, *Phys. Rev. Lett.* **110**, 177203 \(2013\)](#)).
15. Demonstration, together with the group from Dortmund University, of a new method for storing optical information. This method uses a stimulated photon echo, in which the information contained in an optical field (light pulse) is transferred to the electron spin system of the CdTe QW and after a while again radiated in the form of a light pulse that is a copy of the original light pulse. In the “storage” state, information in the form of the quantum excitation of the spin system, isolated from the optical field of the vacuum, can last considerably longer than the optical excitation itself. It has been shown ([L. Langer, S.V. Poltavtsev, I.A. Yuqova, M. Salewski, D.R. Yakovlev, G. Karczewski, T. Wojtowicz, A.V. Akimov, M. Bayer, *Nature Photonics* **8**, 851 \(2014\)](#)), that the time of the information storage in this new type of spintronic memory can be extended by more than three orders of magnitude, from the picosecond range up to tens of nanoseconds.
16. Revealing (together with the group from Dortmund University) of the new mechanism of a long range *p-d* exchange interaction mediated by elliptically polarized phonons ([V.L. Korenev, M. Salewski, I.A. Akimov, V.F. Sapega, L. Langer, I.V. Kalitukha, J. Debus, R.I. Dzhioev, D.R. Yakovlev, D. Müller, C. Schröder, H. Hövel, G. Karczewski, M. Wiater, T. Wojtowicz, Y. Kusrayev, M. Bayer, *Nature Physics* **12**, 85 \(2016\)](#)).

Organisational achievements

- Co-founder (1992 -) (with Prof. J. Kossut, at that time Institute’s Deputy Director for Scientific Affairs) and person in charge of the Laboratory of Molecular Beam Epitaxy (MBE) at the Institute of Physics PAS, currently Laboratory of Growth and Physics of Low Dimensional Crystals. This MBE Laboratory was equipped with the first in Poland, commercial molecular beam epitaxy (MBE) system from American company EPI (currently VEECO). Over the years the Lab has been improved and expanded. This expansion included purchase of the second MBE chamber connected with the first one through UHV, as well as setting a number of experimental set-ups for extensive characterization of produced nanostructures (optical and electrical). The laboratory was very successful and for more than 22 years has been producing top quality II-VI nanostructures used for a

variety of experiments not only in many scientific institutions in Poland but also all over the world. It suffices to say that over 6500 structures have been grown in the Lab since its creation and the results obtained with the use of these structures have been published in over 600 scientific papers.

- Co-founder (2008 -) (with the Laboratory of Cryogenic and Spintronic Research) of the Microscopy and Nanolithography Laboratory. This Laboratory was equipped with a new generation ZEISS Auriga cross-beam system having the functionality of high definition electron-beam (EB) and focus ion beam (FIB) lithography, gas injection system (GIS) for in-situ deposition of metals and oxides and Energy Dispersive X-ray (EDX) spectroscopy. Later the Lab was upgraded by installing additional SEM system with the functionality of low temperature cathodoluminescence (CL) and electron beam induced current (EBIC). This Laboratory played a crucial role in the process of developing bottom-up growth technology of nanowires (based on gold catalyst and Vapour-Liquid-Solid mechanism), top-down EBL technology of making wires (such as the first ever made CdTe-based Quantum Point Contact) and making the first devices from PbTe and HgTe/(Hg,Cd)Te layered nanostructures.
- Initiator and Co-founder (2013 -) of the Institute's new Universal Technological Line for Studies of Fabrication Processes of Nanostructures and Prototypes of Semiconductor, Superconductor and Metallic Devices – presently at the final stage of development. This line will be equipped with the new, two-chamber MBE system, atomic layer deposition system (ALD), ultra high vacuum (UHV) metal deposition system, two reactive ion etching systems (one chlorine based and another fluorine based) and optical lithography.

Research experience:

Far infrared spectroscopy techniques, including generation, magnetospectroscopy, and far infrared detection.

Magneto-optical methods of the studies of semiconductors, including reflectivity, absorption, PL and PLE.

Deep Level Transient Spectroscopy technique.

Cryogenic techniques (down to mK temperatures -dilution refrigerator) - use and development.

Electrical transport and magnetotransport techniques (*ac* and *dc*), including Hall and resistivity at mK temperatures and for very high resistivity materials (up to $10^{12} \Omega\text{cm}$), specialized contact preparation.

SQUID magnetometry.

General preparation and characterization of semiconductor specimens, including polishing, etching, preparation of ultra thin samples, samples annealing, etc.

Molecular Beam Epitaxy (MBE) technology –use and development.

Growth of advanced quantum structures (“wedge-like” structures, graded quantum wells –e.g. parabolic, high electron mobility structures, self assembled quantum dots, T-shaped quantum

wires, VLS grown nanowires) – experience with II-VI semiconductors, especially with diluted magnetic semiconductors.

MBE growth of III-V ferromagnetic semiconductors and their nanostructures (QWs, nanowires)

Research Grants:

(listed only those in which served as Principal or Co-Principal Investigator):

- 2017 – 2022 project No. MAB/2017/1, from the Foundation for Polish Science within the IRA Programme financed by EU within SG OP Programme
„International Centre for Interfacing Magnetism and Superconductivity with Topological Matter ”
9 300 000 € - *Co-Principal Investigator*
- 2013 – 2018 project No. DEC-2012/06/A/ST3/00247, from National Centre of Science (Poland)
„ New generation of quantum nanostructures with ultra high mobility of electrons and unique spin properties: from technology to basic research”
715 000 € - *Principal Investigator*
- 2008 – 2013 project No. POIG.01.01.02-00-008/08, co-financed by EU within European Regional Development Fund, through grant Innovative Economy:
„Semiconductor quantum structures for applications in biology and medicine”
Co-Principal Investigator responsible for Task No. 3: “ ZnO/metal Schottky junctions and optymization of their parameters. Development of oxide nanostructures.”
1 000 000 € - budget of Task No. 3
- 2009 – 2011 project No. POIG.02.09.00-00-003/08, co-financed by EU within European Regional Development Fund, through grant Innovative Economy:
“National Laboratory of Quantum Technologies”
Co-Principal Investigator, Project coordinator for scientific and technical matters in the Institute of Physics, PAS
1 000 000 € - budget of the Institute of Physics,
- 2007 – 2010 project No. 12/2007 from the Foundation for Polish Science (Program „Master”)
„II-VI semiconductor nanowires for nanoelectronics, biology and medicine”
150000 \$ - *Principal Investigator*
- 2006 – 2008 project No. N-507 030 31/0735 from the Ministry of Science and Higher Education, Poland
„Technology of catalytic MBE growth of A^{II}B^{VI} semiconductor nanowires for electronics of the future”
110000 \$ - *Principal Investigator*
- 2004 – 2007 project No. INTAS 03-51-5266 from EC
„Spin properties of charge carriers confined in II-VI semiconductor nanostructures”
12000 € and
3900 € support from Poland - *Principal Investigator*
- 1997 – 2000 project No. PBZ 028.11/P8 from the Polish State Committee for Scientific Research,

“Two-, one- and zero-dimensional semiconductor heterostructures of group II tellurides and diluted magnetic semiconductors within a perspective of optoelectronics applications”.

250000 \$ - *Principal Investigator*

1996 – 1998 project No. 8T11B 014 11 from the Polish State Committee for Scientific Research, “Band gap engineering in molecular beam epitaxy grown low dimensional structures made of II-VI semiconductors for optoelectronic applications”.

65000 \$ - *Principal Investigator*

Main Investigator and Investigator in many other research projects.

Awards:

1. Award of the Polish Physical Society for the master degree thesis, 1980.
2. Award of the Director of the Institute of Physics, Polish Academy of Sciences, 1983, for the development of the computer controlled system for studies of transport properties of high resistivity semiconductors (up to $10^{12} \Omega\text{cm}$) at low temperatures and in the presence of high magnetic fields.
3. Award of the Director of the Institute of Physics, Polish Academy of Sciences, 1985, for the studies of “magnetic boil-off” and giant negative magnetoresistance in the hopping conductivity regime in $p\text{-Hg}_{1-x}\text{Mn}_x\text{Te}$.
4. Award of the Scientific Secretary of the Polish Academy of Sciences, 1986, for the studies of electrical transport in the regime of weak localization and the discovery of the magnetic field induced metal-insulator transition in the spin polarized universality class.
5. Award of the Scientific Board of the Institute of Physics, Polish Academy of Sciences, 1988, for the Ph.D. thesis.
6. Award of the Director of the Institute of Physics, Polish Academy of Sciences, 1994, for the development of the Molecular Beam Epitaxy method for the growth of quantum structures made of II-VI weakly diluted magnetic semiconductors (based on MnTe).
7. Award of the Director of the Institute of Physics, Polish Academy of Sciences, 1996, for the studies of low dimensional structures made of $\text{Cd}_{1-x}\text{Mn}_x\text{Te}$ diluted magnetic semiconductor.
8. **Gold Cross of Merit**, awarded by President of Poland in 2003.
9. **Subsidy „Master” from the Foundation for Polish Science**, 2007.
10. **Order Polonia Restituta of fifth class** awarded by President of Poland in 2013.

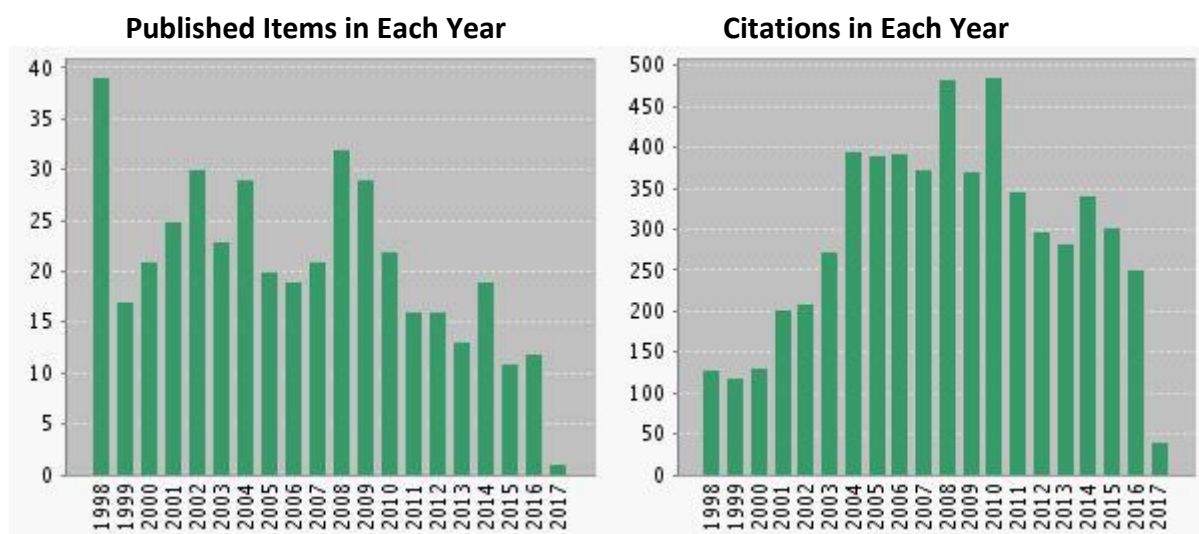
11. [Award of the Minister of Science and Higher Education for the Outstanding Scientific Achievements in the category of basic science, 2013.](#)
[“for fundamental contributions to development of molecular beam epitaxy and studies of unique quantum structures with programmable spin properties”](#)
12. Sabbatical Fellowship of the Foundation for Polish Science 2014.

Publications

Co-author of chapters in three books (2 from Elsevier, 1 from Springer) over **500 published English peer-reviewed research papers** (over 530 items found at the Web of Science as of March 16, 2017) , including: **1 in Nature Materials (IF₂₀₁₆=38.891)**, **1 in Science (IF₂₀₁₆=34.661)**, **1 in Nature Photonics (IF₂₀₁₆=31.167)**, **1 in Nature Physics (IF₂₀₁₆=18.791)**, **4 in Nano Letters (IF₂₀₁₆=13.779)**, **1 in Nanoscale (IF₂₀₁₆= 7.760)**, **22 in Physical Review Letters (IF₂₀₁₆=7.645)**, **7 in Nanotechnology (IF_{5years}=4.885)**, **2 in Grystal Growth&Design (IF₂₀₁₆=4.425)**, **94 in Physical Review B (IF₂₀₁₆=3.718)** and **42 in Applied Physics Letters (IF₂₀₁₆=3.142)**. Apart from the regular papers co-author of over **350** presentations (poster, oral, and invited) at International Conferences and Schools and published in the form of **“abstract only”**. Co-author of **107 invited and plenary talks at International Conferences and Schools**, 42 of which he presented himself (including both published and “abstract only”). In recognition of his contribution to the physics and technology of diluted magnetic semiconductor nanostructures, he was invited to deliver plenary talks at the [18th International Conference on Molecular Beam Epitaxy \(Flagstaff, 2014\)](#) and [Joint 20th International Conference on Electronic Properties of Two-Dimensional Systems - EP2DS & 16th International Conference on Modulated Semiconductor Structures – MSS \(Wrocław, 2013\)](#).

[Citation statistics at ResearcherID Publications](#)

.. Citation report from ISI Web of Science (March 16, 2017)



Results found: **530**

Sum of the Times Cited: **6196**

Sum of Times Cited without self-citations: **5152**

Average Citation per Item: **11.69**

Average Total Citation Rate per year during past decade (2007-2016): ~ **300/year**

H-index: 37

Invited and plenary talks at international conferences and schools.

- I-1. *"Acceptor states in Semimagnetic Semiconductors"*,
T. Wojtowicz,
Int. Symposium on Semimagnetic Semiconductors, Bad Honnef, Germany (1984) - abstract only - **invited**.
- I-2. *"Semimagnetic Semiconductors near the metal-insulator transition"*,
T. Dietl, M. Sawicki, T. Wojtowicz, J. Jaroszynski, W. Plesiewicz, and A. Lenard,
19-th Int. Conf. on Phys. of Semiconductors, Warsaw, Poland, 1988, ed. W. Zawadzki (Institute of Physics Polish Academy of Sciences, Warsaw, 1988) p. 1189 (1988) - **invited**.
- I-3. *"Interaction Effects near the Metal-Insulator Transition in Semimagnetic Semiconductors"*,
T. Dietl, M. Sawicki, T. Wojtowicz, J. Jaroszynski, W. Plesiewicz, L. Swierkowski, and J. Kossut,
Int. Symposium on Anderson Localization, Tokyo 1988, in: Anderson Localization, ed. T. Ando and H. Fukuyama (Springer, Berlin 1988) p. 58 (1988) - **invited**.
- I-4. *"Localization in Diluted Magnetic Semiconductors"*,
T. Dietl, M. Sawicki, J. Jaroszynski, J. Wrobel, T. Wojtowicz, and A. Lenard,
Localization and Confinement of Electrons in Semiconductors, ed. F. Kuchar, H. Heinrich and G. Bauer Springer Series in Solid State Sciences, Vol 97 (Springer Verlag, Berlin, Heidelberg, 1990) p. 127 (1990) - **invited**.
- I-5. *"Far-infrared magneto-optical studies of HgTe-CdTe superlattices in the semimetallic regime"*,
T. Wojtowicz, M. Dobrowolska, J. K. Furdyna, J. R. Meyer, F. J. Bartoli, C. A. Hoffman, and L. R. Ram-Mohan,
Acta Physica Polonica A **80**, 245 (1991)- **invited**.
- I-6. *"Photomemory effect in II-VI Semimagnetic Semiconductors"*,
T. Wojtowicz,
German - Polish Symposium on Semimagnetic Semiconductors, Jachranka, (1993) - abstract only - **invited**.
- I-7. *"MBE growth and characterization of layers and low-dimensional structures of II-VI compounds with Mn in the SL-3 Laboratory of the Institute of Physics in Warsaw"*,
T. Wojtowicz,
2-nd Symposium on Surface and Thin Film Structures, Kazimierz Dolny, Poland, September 14-17 (1994) - abstract only - **invited**.
- I-8. *"Spin tracing: a tool of interface characterization in structures with semimagnetic semiconductors"*,
J. Gaj, P. Kossacki, Nguyen-The-Khoi, J. Cibert, W. Grieshaber, Y. M. D'Aubigne, G. Karczewski, and J. Kossut,
Proc. SPIE Conf. on Laser and Optoelectronics, San Jose 1995, ed. by M. Razeghi, Y. S. Park, G. L. Witt, Vol. 2397, p. 105 (1995) - **invited**.
- I-9. *"MBE growth of CdTe:In layers"*,
G. Karczewski, T. Wojtowicz, and J. Kossut,
3-rd Symposium on Surface and Thin Film Structures, Spala, Poland (1995)- abstract only - **invited**.
- I-10. *"In situ doping of CdMnTe layers grown by molecular beam epitaxy"*,
G. Karczewski, T. Wojtowicz, and J. Kossut,
International School-Conference "Solid State Physics, Fundamentals and Applications", Ukraina (1995)- abstract only - **invited**.
- I-11. *"Weakly diluted magnetic CdTe/Cd_{1-x}Mn_xTe semiconductor structures grown by MBE"*,
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 Proc. of The Second Workshop on Physics of Semiconductors, April 24-26, 2005, Lattakia, Syria, abstract only – **invited**.
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T. Wojtowicz,
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T. Wojtowicz,
 Inter-Academy Meeting on “Nano-science and Nano-technology: risks and benefits for healths and environment”, November 21-23, 2007, Paris, France, abstract only - **invited**.
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- I-68. *„Semiconductor nanowires based on zinc”*,
T. Wojtowicz,
 1-st National Conference on Nanotechnology, 26-28 April 2007 r, Wrocław, Poland, abstract only – **invited**.
- I-69. *„Zn_{1-x}Mn_xTe-based diluted magnetic semiconductor nanowires grown by catalytically enhanced MBE”*,
T. Wojtowicz,
 Polish-Japanese Joint Seminar on Ferromagnetism and Magnetic Nanostructures in Semiconductors, September 27-28, 2007, Leszno near Warsaw, Poland, abstract only - **invited**.
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T. Wojtowicz,
 Workshop on Recent Advances in Low Dimensional Structures and Devices (WRA-LDSD), April 7-9, 2008, Nottingham, UK - abstract only - **invited**.
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T. Wojtowicz,
 2-nd National Conference on Nanotechnology, 24-28 June 2008 r, Kraków, Poland, abstract only – **plenary**.
- I-74. *Zn_{1-x}Mn_xTe-based diluted magnetic semiconductor nanowires grown by catalytically enhanced MBE”*,
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- I-75. *“Raman spectroscopy of MBE-grown, ZnTe-based nanowires”*,
 W. Szuszkiewicz, J.F. Morhange, E. Janik, W. Zaleszczyk, G. Karczewski, T. Wojtowicz,

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- I-76. *"Raman spectroscopy of ZnTe-based nanowires grown by MBE"*,
W. Szuszkiewicz, J.F. Morhange, E. Janik, W. Zaleszczyk, G. Karczewski, T. Wojtowicz,
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T. Wojtowicz,
1-st Conference on Quantum Semiconductor Nanostructures for Biology and Medicine Applications, February 3-4, 2009, Warsaw, Poland – **invited**.
- I-78. *"MBE Growth and Properties of Telluride Nanostructures"*,
T. Wojtowicz,
15th European Molecular Beam Epitaxy Workshop, March 8-11, 2009, Zakopane, Poland - **invited**.
- I-79. *„Nanowires and 2D modulation doped nanostructures based on tellurides"*,
T. Wojtowicz,
E-MRS Fall Meeting, September 14 - 18, 2009, Warsaw University of Technology, Warsaw, Poland - **invited**.
- I-80. *„II-VI semiconductor nanostructures for nanoelectronics, biology and medicine of the future"*,
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XL Meeting of the Polish Physical Society, September 6-11 2009, Kraków, Poland - **invited**.
- I-81. *„Self-assembled epitaxial quantum dots formed by phase separation"*,
G. Springholz, T. Schwarzl, S. Kriechbaumer, H. Groiss, A. Hochreiner, W. Heiss, F. Schaffler, E. Kaufmann, S. Pichler, T. Wojtowicz, K. Koike, T. Hotei, H. Harada, and M. Yano,
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- I-82. *„Excitons in motion in II-VI semiconductors"*,
J. J. Davies, L. C. Smith, D. Wolverson, V. P. Kochereshko, H. Boukari, J. Cibert, H. Mariette, M. Wiater, G. Karczewski, and T. Wojtowicz,
14th International Conference on II-VI Compounds, August 24 - 28, 2009, St. Petersburg, Russia - **invited**.
- I-83. *"Development of oxide nanostructures"*,
T. Wojtowicz,
2-nd Conference on Quantum Semiconductor Nanostructures for Biology and Medicine Applications, April 13-14, 2010, Warsaw, Poland – **invited**.
- I-84. *"A novel synthesis method for fabrication of self-assembled quantum dots based on phase separation"*,
G. Springholz, A. Hochreiner, T. Schwarzl, S. Kriechbaumer, H. Groiss, E. Kaufmann, S. Pichler, W. Heiss, F. Schäffler, T. Wojtowicz, K. Koike, T. Hotei, H. Harada, and M. Yano,
Villa Conference on Interactions Among Nanostructures (VCIAN), June 21-25, 2010, Santorini, Grece - **invited**.
- I-85. *"Widely tunable mid-infrared photoluminescence from epitaxial PbTe quantum dots embedded in a CdTe matrix"*,
A. Hochreiner, T. Schwarzl, S. Kriechbaumer, M. Eibelhuber, H. Groiss, V. Kolkovsky, G. Karczewski, T. Wojtowicz, W. Heiss, G. Bauer, and G. Springholz,
30th International Conference on the Physics of Semiconductors, July 25-30, 2010, Seoul, South Korea - **invited**.
- I-86. *„Lead salt microdisk lasers"*,
G. Springholz, M. Eibelhuber, A. Hochreiner, T. Schwarzl, H. Groiss, T. Wojtowicz, and W. Heiss,
15th International Conference on Narrow Gap Semiconductors (NGS15), Virginia, USA, August 1 - 5, 2011- **invited**.
- I-87. *„Epitaxial IV-VI quantum dots for mid-infrared devices"*,
T. Schwarzl, M. Eibelhuber, A. Hochreiner, H. Groiss, V. Kolkovsky, G. Karczewski, T. Wojtowicz, W. Heiss and G. Springholz,
XIII International Conference on Physics and Technology of Thin Films and Nanostructures (ICPTTFN-XIII), Ivano-Frankivsk, Ukraine, May 16 – 21, 2011- **invited**.
- I-88. *„MBE growth of IV-VI quantum dots for MIR devices"*,
M. Eibelhuber, A. Hochreiner, T. Schwarzl, H. Groiss, W. Heiss, G. Springholz, V. Kolkovsky, G. Karczewski, and T. Wojtowicz,

- 16th European Molecular Beam Epitaxy Workshop (Euro-MBE 2011), L'Alpe d'Huez, France, March 20 - 23, 2011- **invited**.
- I-89. „*First mid-infrared quantum dot lasers emitting at wavelengths beyond 3 μm*”,
G. Springholz, M. Eibelhuber, A. Hochreiner, M. Witzam, T. Schwarzl, H. Groiss, W. Heiss, and T. Wojtowicz,
The 15th Conference on Modulated Semiconductor Structures (MSS 15), July 25 -29, 2011, Tallahassee, FL, USA - **invited**.
- I-90. „*High quality 2D electron gas in CdTe quantum wells for the physics of the quantum Hall effect*”,
B. A. Piot, J. Kunc, K. Kowalik, F. J. Teran, P. Płochocka, D. K. Maude, M. Potemski, C. Betthausen, A. Vogl, D. Weiss, G. Karczewski, and T. Wojtowicz,
15th International Conference on II-VI Compounds, Mayan Riviera, Mexico, August 21-26, 2011- **invited**.
- I-91. „*High mobility CdTe and CdMnTe based 2 DEG nanostructures: from technology to applications in basic research and applied science*”,
T. Wojtowicz,
Joint Polish-Japanese Workshop on Spintronics - from New Materials to Applications, November 15-18, 2011, Warsaw, Poland- abstrakt only - **invited**.
- I-92. “*Terahertz radiation from spin coherence in diluted magnetic semiconductors*”,
R. Rungsawang, F. Perez, D. Oustinov, J. Gomez, V. Kolkovsky, G. Karczewski, T. Wojtowicz, J. Madéo, N. Jukam, S. S. Dhillon, and J. Mignon,
37th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz), Wollongong, Australia, September 23-28, 2012 - **invited**.
- I-93. “*Detection and generation of THz radiation with the use of quantum nanostructures*”,
T. Wojtowicz,
4-th Conference on Quantum Semiconductor Nanostructures for Biology and Medicine Applications, April 18-19, 2012, Warsaw, Poland - abstrakt only – **invited**.
- I-94. “*(Cd,Mn)Te-based quantum structures with ultra-high mobility 2D electron gas: from technology to basic and applied research*”,
T. Wojtowicz,
42nd “Jaszowiec” International School and Conference on Physics of Semiconductors, Wisła, Poland, June 26-27, 2013, abstract only - **invited**.
- I-95. “*II-VI Diluted Magnetic Semiconductor Nanostructures for Spintronic Research*”,
T. Wojtowicz,
[Joint 20th International Conference on Electronic Properties of Two-Dimensional Systems - EP2DS & 16th International Conference on Modulated Semiconductor Structures - MSS, Wrocław, Poland, July 1-5, 2013 – abstrakt only – plenary.](#)
- I-96. “*Giant spin splitting in ZnMnTe/ZnTgTe core/shell nanowires*”,
P. Wojnar, E. Janik, J. Suffczyński, J. Papierska, M. Szymura, W. Zaleszczyk, S. Kret, Ł. Kłopotowski, T. Wojciechowski, L. T. Baczewski, G. Karczewski, T. Wojtowicz, and J. Kossut,
The 16th International Conference on II-VI Compounds and Related Materials, September 9 – 13, 2013, Nagahama, Japan, p. 15. – **invited**.
- I-97. “*Spintronic research with (Cd,Mn)Te-based diluted magnetic semiconductor quantum structures*”,
T. Wojtowicz,
The European Conference on Physics of Magnetism, 23-27 June, 2014, Poznań, Poland – **invited**.
- I-98. “*MBE-Grown II-VI Diluted Magnetic Semiconductor Nanostructures for Spintronic Research*”,
T. Wojtowicz,
[18th International Conference on Molecular Beam Epitaxy, 7-12 September, 2014 Flagstaff, Arizona, USA, – abstrakt only – plenary.](#)
- I-99. “*Optically active nanowires and two-dimensional electron gas in II-VI semiconducting compounds for sensor applications*”,
T. Wojtowicz,
6-th Conference on Quantum Semiconductor Nanostructures for Biology and Medicine Applications, May 7-8, 2014, Warsaw, Poland – **invited**.
- I-100. “*Spin engineering in diluted magnetic semiconductor nanostructures*”,
T. Wojtowicz,

- International Conference "Spin physics, chemistry and technology", 1-5 June, 2015, Saint Petersburg, Russia – abstrakt only – **invited**.
- I-101. *"Advances and perspectives in II-VI telluride heterostructures"*,
T. Wojtowicz,
 17th International Conference on II-VI Compounds, 13 - 18 September, 2015, Paris, France – abstrakt only – **invited**.
- I-102. *"Semiconductor Quantum Structures with Programable Spin Properties – from Technology to Basic and Applied Research"*,
T. Wojtowicz,
 43-rd Meeting of the Polish Physicist, Kielce, Poland, 6-11 September, 2015, (Polish Physical Society) – **plenary**.
- I-103. *"The state of the art in MBE growth of telluride nanostructures"*,
 T. Wojtowicz,
 International Conference on Semiconductor Nanostructures for Optoelectronics and Biosensors, 22-25 May, 2016, Rzeszow, Poland – **plenary**.
- I-104. *"The State of the Art in (Cd,Mn)Te Heterostructures: Fundamentals and Applications "*,
 T. Wojtowicz,
 APS March Meeting, 14-18 March 2016, Baltimore, Maryland, USA – **invited**.
- I-105. *"Spin splitting enhancement in ZnMnTe diluted magnetic nanowires"*,
 P. Wojnar, M. Szymura, W. Zaleszczyk, S. Kret, Ł. Kłopotowski, J. Suffczyński, J. Papierska, P. Kossacki, T. Wojciechowski, L.T. Baczewski, E. Janik, G. Karczewski, T. Wojtowicz, J. Kossut,
 EMN Meeting on Nanowires, 16-19 May 2016, Amsterdam, Netherlands – **invited**.
- I-106. *"Gate control of spin polarization in a quantum Hall regime toward reconfigurable network of helical channels"*,
 L. Rokhinson, A. Kazakov, G. Simion, Y. Lyanda-Geller, V. Kolkovsky, G. Karczewski, Z. Adamus, T. Wojtowicz,
 SPIE Conference Spintronics IX, Proc. SPIE Proceedings, **9931** (2016), ed.: H.J. Drouhin, J.E. Wegrowe, M. Razeghi , p. 993139 – **invited**.
- I-107. *"Access to long-term optical memories using photon echoes retrieved from electron spins in semiconductor quantum wells"*,
 S.V. Poltavtsev, L. Langer, O.A. Yugov, M. Salewski, Y.V. Kapitonov, D.R. Yakovlev, G. Karczewski, T. Wojtowicz, A.V. Akimov, M. Bayer,
 SPIE Conference Spintronics IX, Proc. SPIE Proceedings, **9931** (2016), ed.: H.J. Drouhin, J.E. Wegrowe, M. Razeghi , p. 99311V – **invited**.

March 16, 2017