

# CURRICULUM VITAE

## Artur Bednarkiewicz

Place of work: Polish Academy of Sciences



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### EDUCATION and PROFESSIONAL ACTIVITIES:

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- 01.2024-** a member of Scientific Council of Wrocław Doctoral School, ILT&SR PAN
- 09.2023 -** member and vice-director of Material Science Committee within Wrocław Division of Polish Academy of Sciences 2023-2026
- 02.2023 -** deputy director for scientific affairs in Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wrocław, Poland
- 11.2023** Recruitment Council in PAS for the position of Director of ILT&SR PAS
- 05.2022 -** Head of Division of Biomedical Physicochemistry
- 07.2020** **Full professor** in Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wrocław, Poland
- 2018-** a member of Scientific Council of ILT&SR PAS
- 01.2017-05.2018** Director of Scientific Department in Wrocław Research Centre EIT+
- 04.2015** **professor** of Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wrocław, Poland
- 06.2014** member of Young European Academy
- 06.2013** **habilitation** on „Luminescent properties of lanthanide doped fluoride nanoluminophores”, Poland
- 2011-04.2019** Researcher at Polish Center for Technology Development (previously Wrocław Research Centre EIT+) Wrocław, Poland
- 2009-** Researcher in Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wrocław, Poland
- 2005-2008** post-doc position in European Commission - Joint Research Centre, Institute for Health and Consumer Protection, Nanomaterials and Molecular Imaging, Ispra, Italy
- 2003-2005** Researcher in Institute of Low Temperatures and Structure Research, Polish Academy of Sciences, Wrocław, Poland
- 2003** **Ph.D.** Thesis: 'Spectral and laser properties of Yb<sup>3+</sup> doped crystals and glasses' - Institute of Low Temperatures and Structure Research, PAN, Wrocław
- 1998** **M.Sc.** Thesis: 'Generation of 2<sup>nd</sup> harmonic of Neodymium Laser Pumped with Laser Diode' - Institute of Low Temperatures and Structure Research, PAN, Wrocław

1993-1998      Technical University of Wrocław, Poland – Department of Basic Problems of Technology, Application of Electronics in Medicine, 1993-1998

#### RECENT GRANTS:

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- *Novel anti-Stokes lanthanide-doped nanoparticles and multicolor FRET mechanisms for single-molecule DNA sequencing (LantaSEQ), a co-PI, NCN OPUS-WAVE UNISONO (03.2022-03.2025)*
- *Sensitized Photon Avalanche Emission in lanthanide doped colloidal core-shell nanoparticles: novel materials for superresolution imaging (SPA), a PI, NCN OPUS22 (08.2022-08.2026)*
- *Photon avalanche in nano and micro- inorganic crystals doped with lanthanide ions, a PI, NCN OPUS 2018/31/B/ST5/01827 (09.2019-08.2022)*
- *Theoretical and Experimental Devising Photon Avalanche Emission Nanoparticles, a PI, Molecular Foundry #5973, U.S. Department of Energy National Laboratory Operated by the University of California*
- *Uczulanie luminoforów domieszkowanych lantanowcami poprzez jony metali przejściowych dla termometrów o wysokiej jasności, BEETHOVEN CLASSIC 3, NCN, researcher*
- *“Nanoparticles-based 2D thermal bioimaging technologies”, NanoTBTech FETOPEN-01-2016-2017 within H2020-FETOPEN-2016-2017, a PI of Polish partner of the consortium, 09.2018-09.2021*
- *„Photon Avalanche based Optical Thermometry” / „Termometria luminescencyjna bazująca na lawinowej emisji fotonów”, a researcher, budget 1.5 mln PLN 2018-2021*
- *„Multifunctional Optical Trapping and Optical Microrobots to study localized hyperthermia of cells and cellular spheroids from primary cell cultures” / „Opracowanie multifunkcyjnych szczypiec optycznych i mikrorobotów do badania wpływu zlokalizowanej hipertermii na komórki i sferoidy nowotworowe uzyskane z hodowli pierwotnych”, NCN OPUS 14, 2018-2021, PI of one of the partners of the consortium*
- *“The European Upconversion Network From the Design of Photon-upconverting Nanomaterials to (Biomedical) Applications” – EU COST Action CM1403, co-applicant, Short Term Scientific Mission Manager*
- *“Lanthanide doped colloidal core-shell nanoparticles: synthesis and active modulation of spectral properties”, task leader, grant from National Research Center, Poland, 4.2013-4.2018,*
- *„Exploitation of electrical, spectral and optical methods in biodetection and bioimaging” – EIT+ Wrocław Research Centre, task leader (1.2011-6.2015)*
- *Lanthanide doped nanoluminophores as active elements In biosensors, task leader (2010-2012), grant MNISW NN 507 58 49 38*
- *Synthesis and spectral properties of biocompatible nanocomposites: SiO<sub>2</sub> and lanthanide doped fluoride nanocrystals as selective luminescent markers In bioapplications, grant MNISW NN 507499538, (2010-2012), researcher*
- *Nano biotechnologies for health application Nano BioTech, FP6, action 4221. Researcher, topic – development of advanced fluorescence spectroscopy methods for imaging and sensing in vitro*
- *In vitro testing technologies and assay automation InViTech, FP6, action 4224, Researcher, topic: Noninvasive and non-destructive cytotoxicity studies in vitro*

#### EXPERIENCE:

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- Consultant of · LaserSecura Ltd. (medical lasers, software), Wrocław Poland; · MediCom Ltd. (software, video diagnosis equipment) Wrocław, Poland; · Optel Ltd. (document/banknotes protection, optical components) Wrocław, Poland; · Haemato GmbH (photodynamic cancer diagnosis and treatment) Berlin, Germany, .
- A co-owner of Nanovectors spin-off company (2012-2018), Lantalux spin-off (2016-2018)
- Member of the Organising Committee of the following international conferences: International Conference on Luminescence ICL'14 Wrocław (2014), International Conference on f-elements (2005), International Symposium on New Trends in Photodynamic therapy and Diagnosis (2004), Rare-earth systems (2003), Excited State of Transition Elements (2001); Organiser and chairman

of 1st European Conference and Spring School on Properties and Applications of Upconverting Nanoparticles 2016 Wrocław; member of Organizing Committee of UPCON conference (2018,2020,2022, 2024)

- Reviewer in scientific journals (Nature Nanotechnology x3, Nature Photonics x2, Nature Materials x3, ACS Nano x6, Nat.Comm.x7, Nature Sci.Reports x3, Chem.Soc.Rev x4, Nano Letters x2, ACS Photonics x2, ACS Appl.Mat. x1, ACS App.Nano.Mat x1, Optical Materials x32, Light: Science & Applications x9, J.Luminescence x22, Optics Express x2, Journal of the American Chemical Society x3, Small x4, ACS The Journal of Physical Chemistry, 1x PCCP, 3x RSC J.Materials Chemistry C, Advanced Materials x4, Advanced Photonics Research x3, RSC Advances x5, RSC Nanoscale 16x, RSC Nanoscale Advances x1, RSC Nanoscale Horizon x1, Materials Science & Engineering, Toxicology Letters, Advanced Optical Materials x10, ACS Applied Materials & Interfaces x5, ACS Omega x1, Coord.Chem.Rev. x1, RSC Chemical Communications x2, JBO x1, 11x RCS Dalton Transactions, IOP Nanotechnology, Sensors and Actuators B:Chemical x1, Applied Surface Science x1, Springer Series "Bioanalytical Reviews", Industrial & Engineering Chemistry Research., Nanophotonics x4, J.Nanoparticle Research 3x, J.Mat.Chem.B x2, Photochemical & Photobiological Sciences x2, Optics & Laser Technology x1, Methods and Applications in Fluorescence x3, Journal of Hazardous Materials x1, J.Alloys&Compounds 17x, Journal of Applied Physics 4x, AIP APL x2, ChemPhysChem x2, Dyes and Pigments, Nano-Micro-Letters x1, Analytical Chemistry x2, Methods and Applications in Fluorescence x1, Chemical Engineering Journal 2x, Applied Physics Express x1, J.Fluorine Chemistry 1x, Journal of Physical Chemistry Letters 2x, Materials Letters x1, Angewandte Chemie x1)
- Reviewer / evaluator of grant proposals (8x REA FET Open, 62x cross—reader REA FET Open (2016–2022), 18x Preludium NCN, 4x Foundation for Polish Science, 2x NCN Preludium, 17x NCN Opus, Marsden Fund Proposal (Australia), x35 Short Term Scientific Mission reviewer and manager within COST1403 EU action), InterTalentum (Spain 2016), 2x Research Foundation Flanders (Fonds Wetenschappelijk Onderzoek - Vlaanderen, FWO), Czech National Science Foundation (2018), Research Grants Council of Singapore(2020), 2x Social Sciences and Humanities Research Council of Canada (2020)
- Lecturer of specialised medical courses concerning lasers applications in diagnosis and treatment, occasionally lecturer in Technical University Wrocław; lecturer during Festival of Science in Wrocław (2001,2003, 2011, 2013), Scientific Nights (2017), University of Kids (2016, 2018) Poland
- Supervisor of several M.Sc. theses concerning lanthanide spectroscopy, solid-state lasers, biospectroscopy, lasers and medical applications of light. Two of the students received prizes for best M.Sc. thesis (p.D.Wawrzynczyk – Polish Physical Society, Pawel Gacek–Stowarzyszenie Elektryków Polskich), (- J.Zasada Politechnika Wrocławska 2019, - M.Pawliszewska Politechnika Wrocławska 2014, - A.Darecki Politechnika Wrocławska 2012, - B.Gajdzis Politechnika Wrocławska 2012, - A.Wajdzik Politechnika Wrocławska 2012, - D.Mosio Politechnika Wrocławska 2010, - K.Mokrzycka Wydział Fizyki, UWr 2011; 2012 - Justyna Dobosz Wydział Fizyki, UWr 2011, - D.Wawrzyńczyk Politechnika Wrocławska 2011, - K.Jakubczyk Politechnika Wrocławska 2005, - J.Lewandowski Politechnika Wrocławska 2005, - P.Gacek Politechnika Wrocławska 2005)
- Supervisor of stageries: Adrian Kain (PWr2020), Jakub Nalewaj (PWr2020), Teresa Sembratowicz (PWr2020), Barbara Kamińska (Pwr 2020), Małgorzata Korona (PWaw2020), Julia Wnętrzak (PWr 2022), Jastin Poptawski (PWr 2022)
- Promotor of 5 Ph.D. theses
  - dr Katarzyna Prorok – The impact of active and passive dopants on the spectroscopic properties of Yb and Tb doped NaYF<sub>4</sub> colloidal nanocrystals, 11.2016, defense with distinctions
  - dr Małgorzata Misiak - The influence of active and passive ions' doping on the spectroscopic properties of colloidal NaYF<sub>4</sub> nanocrystals doped with Yb<sup>3+</sup> and Tm<sup>3+</sup>, 11.2016, defense with distinctions
  - dr Aleksandra Pilch 11.2020 – The impact of composition and chemical architecture on the luminescent properties of colloidal NaYF<sub>4</sub> nanoparticles co-doped with Yb<sup>3+</sup> i Ho<sup>3+</sup>, 11.2018, defense with distinctions

- dr Agata Kotulska 8.12.2022 - "Evaluating the impact of chemical composition and architecture of lanthanide doped colloidal core-shell NaYF<sub>4</sub> nanoparticles on their luminescence properties: from fundamental material science to bio-nano-technological applications", 12.2022, defended with distinctions
- dr Agnieszka Paściak - "Standardization of the photothermal conversion efficiency methodology and quantitative evaluation of colloidal nanoheaters" 03.2022, defended with distinctions
- M.Sc. Magdalena Dudek (expected defence 03.2024) - "Synthesis, modeling and spectroscopic evaluation of selected Tm<sup>3+</sup>, Pr<sup>3+</sup>, Ho<sup>3+</sup> doped and Yb<sup>3+</sup> co-doped colloidal photon avalanching nanoparticles"
- M.Sc. Zuzanna Korczak (expected defence 03.2024) - "Evaluation of luminescent properties of photon avalanching nano-, micro- and bulk crystals: novel materials, characterization methods and applications"
- M.Sc. eng. Martyna Majak (expected defence 12.2026)
- M.Sc. eng. Stanislaw Okwiet (expected defence 12.2027)
- five of the ph.d. candidates defended their theses with distinctions (INTiBS PAN)
- opponent to Ph.D. thesis of
  - Laura Pihlgren, "Nir-Vis Up-Conversion Luminescence In The Yb<sup>3+</sup>,Er<sup>3+</sup> Doped Y<sub>2</sub>O<sub>3</sub>S, ZrO<sub>2</sub>, And NaYF<sub>4</sub> Nanomaterials" Turun Yliopisto, University Of Turku, Turku (2015)
  - *Monirehalsadat Mousavi entitled „Luminescence Spectroscopy For Biomedical Applications”, Lund University, Szwecja (2019)*
- reviewer of Ph.D. theses
  - M.Sc. Riikka Arppe "Photon Upconverting nanophosphors: unique reporters for biomedical biosensing" Turun Yliopisto, University Of Turku, Turku (2016)
  - mgr Ewa Kasprzycka (Chemistry Department, Wroclaw University) „Kompleksy lantanowców z sulfonyloamidofosforanami jako konwertery promieniowania elektromagnetycznego – synteza, struktura i spektroskopia" (2018)
  - mgr eng. Kacper Parafiniuk (Chemistry Department, Wroclaw University of Science and Technology) „Wybrane organiczne ośrodki wzmacniające do uzyskiwania przestrajalnej akcji laserowej typu DFB"
  - M.Sc. Anna Borodziuk (Institute of Physics, Polish Academy of Sciences, Warsaw, Poland), 'Properties of upconverting nanoparticles and their application to photodynamic therapy' (2022)
  - Joana da Costa Martins (Department of Physics, CICECO – Aveiro Institute of Materials University of Aveiro, Portugal) 'Primary luminescent Boltzmann thermometers' (2023)

## PUBLICATIONS:

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### Most recent work under review:

*Extreme susceptibility of photon avalanche emission to quenching: challenges and opportunities*, M.Majak, M.Misiak, A.Bednarkiewicz, under review – in this work we study the susceptibility of PA phenomenon in 8% Tm<sup>3+</sup> doped microparticles to the presence of 0.1-1% Nd<sup>3+</sup> energy acceptors. Quenching by the acceptor led to c.a. 10 000-fold luminescence quenching when excited in photon avalanche mode (excitation of excited states) as compared to only 4-fold quenching in the same material excited in Stokes mode (excitation from the ground state). These findings were further used to explain the mechanism and the potential importance of photon avalanche phenomenon for bio-sensing.

### 2023

1. Understanding Yb<sup>3+</sup> sensitized photon avalanche in Pr<sup>3+</sup> co-doped nanocrystals: modelling and optimization, Magdalena Dudek\*, Zuzanna Korczak, Katarzyna Prorok, Oleksii Bezkravnyi, Lining Sun, Marcin Szalkowski, Artur Bednarkiewicz\*, Nanoscale, (2023), 18613-18623, DOI:

10.1039/d3nr04409b.

2. All-Optical Data Processing with Photon Avalanching Nanocrystalline Photonic Synapse, A Bednarkiewicz\*, M Szalkowski, M Majak, Z Korczak, M Misiak, S Maćkowski, Adv Mater. 2023, e2304390. doi: 10.1002/adma.202304390
3. On the role of Gd 3+ ions in enhancement of UV emission from Yb<sup>3+</sup> -Tm<sup>3+</sup> up-converting LiYF<sub>4</sub> nanocrystals, Małgorzata Misiak\*, Orest Pavlosiuk, Marcin Szalkowski, Agata Kotulska, Karolina Ledwa, Artur Bednarkiewicz, Nanotechnology, 2023 Jun 6;34(34). doi: 10.1088/1361-6528/acd701.
4. Single up-conversion nanocrystal as a local temperature probe of electrically heated silver nanowire, K.Wiwałowski, K.Sulowska, R.Houssaini, A.Pilch-Wróbel, A.Bednarkiewicz\*, A.Hartschuh, S.Maćkowski, D.Piątkowski\*, Nanoscale, 2023, 15, 10614
5. Two-dimensional photo-thermo-polymerisation of MMA with Cr<sup>3+</sup> doped nanoheaters K.Maciejewska, A.Paściak, M.Szalkowski, M.Ptak, A.Bednarkiewicz, L.Marciniak, Materials Research Bulletin, Volume 160, April 2023, 112119
6. Highly-doped lanthanide nanomaterials for efficient photothermal conversion – selection of the most promising ions and matrices A.Paściak, M.Misiak, K.Trejgis, K.Elźbieciak-Piecka, O.Bezkrovnyi, Ł.Marciniak and A. Bednarkiewicz\*, J.All.Comp. Volume 934, 10 February 2023, 167900
7. Thermally-induced structural phase transition in rare earth orthophosphate nanocrystals for highly sensitive thermal history paints, K Maciejewska, P Szklarz, A Bednarkiewicz, MD Dramićanin, L Marciniak, Journal of Alloys and Compounds 935, 168064
8. Sensitized photon avalanche nanothermometry in Pr<sup>3+</sup> and Yb<sup>3+</sup> co-doped NaYF<sub>4</sub> colloidal nanoparticles, Z.Korczak, M.Dudek, M.Majak, M.Misiak, Ł.Marciniak, M.Szalkowski, A.Bednarkiewicz\*, Low Temperature Physics, 2023, vol.49(3)
9. Improving accuracy and sensitivity of lanthanide-based luminescent manometers by augmented spectral shift method, Pieprz, Mateusz; Runowski, Marcin; Ledwa, Karolina; Carvajal, Joan; Bednarkiewicz, Artur; Marciniak, Lukasz ACS Applied Optical Materials 2023, 1, 6, 1080–1087
10. Bimodal role of Cr<sup>3+</sup> ions: the nanoscaled photothermal agent and luminescence thermometry, K. Maciejewska, A. Paściak, M. Szymczak, K. Ledwa, A. Bednarkiewicz, L. Marciniak, Materials Today Chemistry, Volume 30, 2023, 101579

## 2022

11. Upconversion FRET quantitation: the role of donor photoexcitation mode and compositional architecture on the decay and intensity based responses, Agata M. Kotulska, Aleksandra Pilch-Wróbel, Satu Lahtinen, Tero Soukka\* and Artur Bednarkiewicz\*, Light: Science & Applications (2022)11:256, <https://doi.org/10.1038/s41377-022-00946-x>
12. Size-dependent photon avalanching in Tm<sup>3+</sup> doped LiYF<sub>4</sub> nano, micro and bulk crystals, Magdalena Dudek, Marcin Szalkowski, Małgorzata Misiak, Maciej Ćwierzona, Artiom Skripka, Zuzanna Korczak, Dawid Piątkowski, Piotr Woźniak, Radosław Lisecki, Philippe Goldner, Sebastian Maćkowski, Emory M. Chan, P. James Schuck, Artur Bednarkiewicz\*, Adv. Optical Mater. 2022, 2201052, <https://doi.org/10.1002/adom.202201052>
13. Lanthanide-doped Heterostructured Nanocomposites toward Advanced Optical Anti-Counterfeiting and Information Storage" by Yao Xie, Yapai Song, Guotao Sun, Pengfei Hu, and Artur Bednarkiewicz & Lining Sun\* Light Sci Appl 11, 150 (2022).
14. Photon avalanche in nanoparticles goes multicolour, A.Bednarkiewicz\* and M.Szalkowski, Nature Nanotechnology, News & Views DOI 10.1038/s41565-022-01100-9
15. Highly sensitive luminescence nanothermometry and thermal imaging facilitated by phase transition, L.Marciniak, W.Piotrowski, M.Szalkowski, V.Kinzhybaló, M.Drozd, M.Dramićanin, A.Bednarkiewicz, Chemical Engineering Journal, Volume 427, 1 January 2022, 131941
16. Phase transition-driven highly sensitive, NIR-NIR band-shape luminescent thermometer based on LiYO<sub>2</sub>:Nd<sup>3+</sup>, L. Marciniak\*, W. Piotrowski, M. Drozd, V. Kinzybahlo, A. Bednarkiewicz, M. Dramićanin, Applied Optical Materials, 2022, Volume10, Issue9, 2102856
17. A single-band ratiometric luminescent thermometer based on tetrafluorides operating entirely in the infrared region, Trejgis Karolina, Ledwa Karolina Anna, Bednarkiewicz Artur [et al.], Nanoscale Advances, 2022, vol. 4, no. 2, pp.437–446. DOI:10.1039/d1na00727k

18. Advancements in excited state absorption-based luminescence thermometry, Joanna Stefańska, Artur Bednarkiewicz and Lukasz Marciniak, *J. Mater. Chem. C*, 2022, 10, 5744
19. A Cr<sup>3+</sup> luminescence based ratiometric optical laser power meter, Marciniak, Lukasz; Szalkowski, Marcin; Bednarkiewicz, Artur; Elzbieciak-Piecka, Karolina, *Journal of Materials Chemistry C*, 10, 2022, 11040
20. Quantitative comparison of light-to-heat conversion efficiency in nanomaterials suitable for photothermal therapy, Pasciak, Agnieszka; Marin, Riccardo; Abiven, Lise; Pilch-Wróbel, Aleksandra; Misiak, Małgorzata; Xu, Wujun; Prorok, Katarzyna; Bezakrovnyi, Oleksii; Marciniak, Lukasz; Chaneac, Corinne; Gazeau, Florence; Bazzi, Rana; Roux, Stéphane; Viana, Bruno; Lehto, Vesa-Pekka; Jaque, Daniel; Bednarkiewicz, Artur\*, *ACS Appl. Mater. Interfaces* 2022, 14, 29, 33555–33566
21. The influence of Ce<sup>3+</sup> codoping on upconversion in nanocrystalline NaYF<sub>4</sub>:Yb<sup>3+</sup>,Tm<sup>3+</sup>, A.Pilch-Wróbel, A.Kotulska, A.Bednarkiewicz, *J.Luminescence*, 2022 251:119116
22. Impact of host composition and dopant ion concentration on the thermometric properties of a Eu<sup>3+</sup> activated fluoride-based single-band ratiometric luminescent thermometer, K. Trejgis, K. Ledwa, A. Bednarkiewicz, L. Marciniak, *Journal of Alloys and Compounds*, 2022, vol.898, 162839
23. Self-Referenced Temperature Imaging with Dual Light Emitting Diode Excitation and Single-Band Emission of AVO<sub>4</sub>:Eu<sup>3+</sup> (A=Y, La, Lu, Gd) Nanophosphors W Piotrowski, L Dalipi, K Elzbieciak-Piecka, A Bednarkiewicz, B Fond, L.Marciniak, *Advanced Photonics Research* 3 (6), 2100139
24. Nd<sup>3+</sup>-sensitized upconversion nanoparticle coated with antimony shell for bioimaging and photothermal therapy in vitro using single laser irradiation ST Dibaba, Y Xie, W Xi, A Bednarkiewicz, W Ren, L Sun, *Journal of Rare Earths* 40 (6), 862-869
25. Nanocrystalline Luminescent Thermometers NaYF<sub>4</sub>: Pr<sup>3+</sup> Using Ground and Excited State Absorption J Drabik, A Bednarkiewicz, K Prorok, Ł Marciniak, *Light-Matter Interactions Towards the Nanoscale*, 315
26. Engineering the Compositional Architecture of Core-Shell Upconverting Lanthanide-Doped Nanoparticles for Optimal Luminescent Donor in Resonance Energy Transfer: The Effects of Energy Migration and Storage, A Pilch-Wrobel, AM Kotulska, S Lahtinen, T Soukka, A Bednarkiewicz, *Small* 18 (18), 2200464
27. Corrigendum to "Impact of host composition and dopant ion concentration on the thermometric properties of a Eu<sup>3+</sup> activated fluoride-based single-band ratiometric luminescent ... K Trejgis, K Ledwa, A Bednarkiewicz, L Marciniak *Journal of Alloys and Compounds* 914, 165345
28. Correction to "Quantitative Comparison of the Light-to-Heat Conversion Efficiency in Nanomaterials Suitable for Photothermal Therapy" A Paściak, R Marin, L Abiven, A Pilch-Wróbel, M Misiak, W Xu, K Prorok, ... *ACS Applied Materials & Interfaces* 14 (34), 39679–39680
29. Correction to "A single-band ratiometric luminescent thermometer based on tetrafluorides operating entirely in the infrared region", *Nanoscale Advances* Trejgis, K; Ledwa, K; Bednarkiewicz, A; Marciniak, L;2022,Royal Society of Chemistry

## 2021

1. From structural phase transition to highly sensitive lifetime based luminescent thermometer: multifaceted modification of thermometric performance in Y<sub>0.9-x</sub>Nd<sub>x</sub>Yb<sub>0.1</sub>PO<sub>4</sub> nanocrystals, K. Maciejewska,\* M. Szalkowski, A. Bednarkiewicz and L. Marciniak\* , *J. Mater. Chem. C*, 2021,9, 15831-15839
2. Predicting the impact of temperature dependent multi-phonon relaxation processes on the photon avalanche behavior in Tm<sup>3+</sup>: NaYF<sub>4</sub> nanoparticles, M. Szalkowski, M. Dudek, Z. Korczak, C. Lee, Ł. Marciniak, E.M. Chan, P.J.Schuck, A. Bednarkiewicz\*, *Optical Materials: X* (2021)12, 100102, doi: <https://doi.org/10.1016/j.omx.2021.100102>.
3. Laser Refrigeration by an Ytterbium Doped NaYF<sub>4</sub> Microspinner E. Ortiz-Rivero, K. Prorok, I. R. Martín,R. Lisiecki, P. Haro-González,\* A. Bednarkiewicz, D. Jaque\* *SMALL* 2021, 2103122
4. Self-Referenced Temperature Imaging with Dual Light Emitting Diode Excitation and Single-Band Emission of AVO<sub>4</sub>:Eu<sup>3+</sup> (A=Y, La, Lu, Gd) Nanophosphors, Wojciech Piotrowski, Łukasz Marciniak, Artur Bednarkiewicz; Fond, Benoit; Karolina Elzbieciak, *Adv Photonics*

- Res. 2021; 3(6):2100139.
- The role of surface related quenching in the single band ratiometric approach based on excited state absorption processes in Nd<sup>3+</sup> doped phosphors, Karolina Trejgis; Feng Tian; Jiang Li; Artur Bednarkiewicz; Lukasz Marciniak, *Materials Research Bulletin*, Mater Res Bull. 2021; 139:111288
  - Correlation between the Covalency and the Thermometric Properties of Yb<sup>3+</sup>/Er<sup>3+</sup> Codoped Nanocrystalline Orthophosphates, K. Maciejewska, A. Bednarkiewicz, A. Meijerink and L. Marciniak\*, *J. Phys. Chem. C* 2021, 125, 4, 2659–2665
  - Luminescence based temperature bio-imaging: status, challenges and perspectives, A. Bednarkiewicz, J. Drabik, K. Trejgis, D. Jaque, E. Ximendes, L. Marciniak, *Applied Physics Reviews* 2021, APPLIED PHYSICS REVIEWS 8 (1) (featured article)
  - Giant nonlinear optical responses from photon avalanching nanoparticles, Changhwan Lee, Emma Xu, Yawei Liu, Ayelet Teitelboim, Kaiyuan Yao, Angel Fernandez-Bravo, Agata Kotulska, Sang Hwan Nam, Yung Doug Suh, Artur Bednarkiewicz, Bruce E. Cohen, Emory M. Chan, P. James Schuck, *Nature*, vol 592, no.7841 (14.01.2021) + cover page, <https://arxiv.org/abs/2007.10551>
  - The influence of the Er<sup>3+</sup> dopant concentration in LaPO<sub>4</sub>:Nd<sup>3+</sup>, Er<sup>3+</sup> on thermometric properties of ratiometric and kinetic-based luminescent thermometers operating in NIR II and NIR III optical windows, K. Maciejewska, A. Bednarkiewicz and L. Marciniak, Nov 1 2021 | *PHYSICA B-CONDENSED MATTER* 620
  - NIR luminescence lifetime nanothermometry based on phonon assisted Yb<sup>3+</sup>-Nd<sup>3+</sup> energy transfer, K. Maciejewska, A. Bednarkiewicz, and L. Marciniak, Sep 7 2021 | Jun 2021 (Early Access) | *NANOSCALE ADVANCES* 3 (17), pp.4918–4925
  - Standardization of Methodology of Light-to-Heat Conversion Efficiency Determination for Colloidal Nanoheaters, A. Paściak, A. Pilch-Wróbel, Ł. Marciniak, P. J. Schuck, A. Bednarkiewicz, *ACS Appl Mater Interfaces*. 2021 Sep 22;13(37):44556–44567. doi: 10.1021/acsami.1c12409. Epub 2021 Sep 9.

## 2020

- Enhancing FRET biosensing beyond 10 nm with photon avalanche nanoparticles*, A. Bednarkiewicz, E. Chan, K. Prorok, *Nanoscale Adv.*, 2020, 2, 4863–4872
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5. White emission of lithium ytterbium tetrphosphate nanocrystals *Strek W.; Marciniak L.; Bednarkiewicz A.; et al. Optics Express* 19(15) 14083-14092 (2011)
6. Tuning red-green-white up-conversion color in nano NaYF<sub>4</sub>:Er/Yb phosphor, *A.Bednarkiewicz, D.Wawrzynczyk, M.Nyk, M.Samoć*, *Journal Rare Earth* 29(12), 1152-1156 (2011)

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7. Up-conversion FRET from Er<sup>3+</sup>/Yb<sup>3+</sup>:NaYF<sub>4</sub> nanophosphor to CdSe quantum dots *A. Bednarkiewicz, M.Nyk, M.Samoc, W.Strek*, *J. Phys. Chem. C*, 114, 17535-17541 (2010)

8. Synthesis and luminescence properties of  $\text{LiLa}_{1-x}\text{Nd}_x\text{P}_4\text{O}_{12}$  nanocrystals Strek W.; Marciniak L.; Lukowiak A.; Bednarkiewicz A. et al. *Optical Materials* 33 (2) 131-135 (2010)
9. Synthesis and Optical Properties of  $\text{Eu}^{3+}$  ion doped Nanocrystalline Hydroxyapatites, R.Wiglusz; A.Bednarkiewicz; A.Lukowiak; W.Strek, *Spectroscopy Letters*, 486716, (2010)
10. Enrichment of hepatocytes in a HepaRG culture using spatially selective photodynamic treatment Bednarkiewicz Artur; Rodrigues Robim M.; Whelan Maurice P., *Journal Of Biomedical Optics* 15(2), 028002 (2010)

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11. Redox State Imaging Of Pancreatic Tumor Cells, Schnekenburger J, Rommel C, Bednarkiewicz A, et al. *Pancreas* 37(4) 494-494 (2008)
12. Global analysis of microscopic fluorescence lifetime images using spectral segmentation and a digital micromirror spatial illuminator , A.Bednarkiewicz and M.P. Whelan, *Journal of Biomedical Optics* 13(4), 041316 (2008)
13. Digital Micromirror Device as a Spatial Illuminator for Fluorescence Lifetime and Hyperspectral Imaging , A.Bednarkiewicz, Mounir Bouhifd and Maurice P. Whelan, *Applied Optics* 47(9), (2008)
14. Laser action in  $\text{LaAlO}_3:\text{Nd}^{3+}$  single crystal, P. J. Dereń, A.Bednarkiewicz, Ph. Goldner and O. Guillot-Noël, *J.Appl.Phys* 103, 043102 (2008)

## 2007

15. Microscopic Fluorescence Lifetime and Hyperspectral Imaging with Digital Micromirror Illuminator, A.Bednarkiewicz and M.P. Whelan, *Proceedings of SPIE - Volume 6630, Confocal, Multiphoton, and Nonlinear Microscopic Imaging III*, Tony Wilson, Ammasi Periasamy, Editors, 66300A (2007)
16. Luminescence properties of Nd : YAG nanoceramics prepared by low temperature high pressure sintering method , Hreniak D.; Fedyk R.; Bednarkiewicz A.; et al.*Optical Materials* 29 (10) 1244-1251 (2007)

## 2006

17. Size Dependence on Infrared Spectra of  $\text{NaGdF}_4$  Nanocrystals, A. Bednarkiewicz, M. Mączka, W. Strek, J. Hanuza, M. Karbowski, *Chemical Physics Letters* 418(1-3), 75-78, (2006)
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20. Synthesis and luminescence properties of  $\text{Eu}^{3+}$ -doped  $\text{LaAlO}_3$  nanocrystals, Hreniak D; Strek W; Deren P; et al. *Journal Of Alloys And Compounds* 408, 828-830 (2006)

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21. Spectral properties of  $\text{Eu}^{3+}$  doped  $\text{NaGdF}_4$  nanocrystals, A.Bednarkiewicz, A.Mech, M.Karbowski, W.Strek, *J.Lumin.*, 114 (3-4), 247-254 (2005)
22. Interstitial single fiber multi-decay-probe for light dosimetry in photodynamic therapy: modeling, A. Bednarkiewicz, W. Strek , *Diagnostic Optical Spectroscopy in Biomedicine III*; Mary-Ann Mycek; Ed., *Proc. SPIE Vol. 5862*, 220-225 (2005)
23. The Susceptibility of Anaerobic Bacteria Isolated from Periodontal Diseases to Photodynamic Inactivation with Fotolon (Chlorin e6), Z.Drulis-Kawa, A.Bednarkiewicz, G.Bugla-Ploskonska, W.Stręk, W.Doroszkiewicz, *Polish Journal of Microbiology* 54, 305-310 (2005)
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25. Comparison of different NaGdF<sub>4</sub>: Eu<sup>3+</sup> synthesis routes and their influence on its structural and luminescent properties Karbowski M; Mech A; Bednarkiewicz A; et al. Journal Of Physics And Chemistry Of Solids 66(6), 1008-1019, (2005)

## 2004

26. Structural and optical properties of nanocrystalline KGdF<sub>4</sub>:Eu<sup>3+</sup> and NaGdF<sub>4</sub>:Eu<sup>3+</sup> powders synthesised from solution, M. Karbowski, A. Mech, A. Bednarkiewicz, W. Stręk, L. Kępiński, Wiadomości Chemiczne, Nanomaterials 63 (2004)
27. Analysis of optical transitions of Nd<sup>3+</sup> in YAG nanocrystallites, A. Bednarkiewicz, Materials Science-Poland, Vol. 22, No. 3, (2004)
28. Blue up-conversion emission in Yb- and Tm-codoped potassium yttrium tungstate, A. N. Kuzmin, A. V. Kachynski, P. N. Prasad, A. A. Demidovich, L. E. Batay, A. Bednarkiewicz, W. Stręk, and A. N. Titov, J. Appl. Phys. 95, 7862 (2004);
29. Influence of uterine cervix shape on photodynamic therapy efficiency, Bednarkiewicz, A., & Stręk, W., J. Biomed. Opt. 9(5), 1013-1017 (2004)
30. New approach to non-oncological photodynamic laser therapy. Podbielska, H., Stręk, W., Bednarkiewicz, A. Deren P., Physica Medica. 20(1) 52-55 (2004).
31. Structural and luminescent properties of nano-sized NaGdF<sub>4</sub>: Eu<sup>3+</sup> synthesised by wet-chemistry route. Mech A., Karbowski M., Kępiński L., Bednarkiewicz A., Stręk W., J. Alloys Compd., 380, 315-320 (2004)
32. Structural and luminescent properties of nanostructured KGdF<sub>4</sub>: Eu<sup>3+</sup> synthesised by coprecipitation method. Karbowski M., Mech A., Bednarkiewicz A., Stręk W., Journal Of Alloys And Compounds, 380, 321-326 (2004)
33. Structure and properties of the KNbW<sub>2</sub>O<sub>9</sub> hexagonal bronze doped with Eu<sup>3+</sup> ions as an optically active probe. Macalik, L., Maczka, M., Hanuza, J. et al., Journal Of Alloys And Compounds, (2004)
34. Synthesis, structure and preliminary spectral properties of K<sub>4</sub>RE<sub>0.01</sub>W<sub>10.99</sub>O<sub>35</sub> hexatungstate bronze-like crystals (RE = Er, Eu). Macalik, L., Hanuza, J., Maczka, M. et al., (2004). Journal Of Alloys And Compounds, (2004)

## 2003

35. On spectroscopic properties of the KYb(WO<sub>4</sub>)<sub>2</sub>: Pr<sup>3+</sup> crystal, .Deren, A. Bednarkiewicz, R. Mahiou and W. Stręk, Molecular Physics, 101(7), 951-960 (2003)
36. Medium power ytterbium lasers, A. Bednarkiewicz, J. Kalisky, W. Stręk, Proc. SPIE Vol. 5230(2003) 139-142, Laser Technology VII: Progress in Lasers; Wiesław L. Wolinski, Zdzisław Jankiewicz, Ryszard S. Romaniuk; Eds.
37. Hot Emission in Nd<sup>3+</sup>/Yb<sup>3+</sup>:YAG nanocrystalline ceramics, A. Bednarkiewicz, D. Hreniak, P. Dereń, W. Stręk, J. Lumin. 102-103, 438-444, (2003)

## ...-2002

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39. In vitro photodynamic diagnosis of atherosclerotic wall changes with use of mono-l-aspartyl chlorin e6, D. Biały, A. Derkacz, M. Wawrzynska, A. Bednarkiewicz, P. Ziolkowski, H. Nowosad, W. Stręk, Polish Cardiology, 23 175-178, (2002)
40. Power dependence of luminescence of Tb<sup>3+</sup> doped KYb(WO<sub>4</sub>)<sub>2</sub> crystal, W. Stręk, A. Bednarkiewicz and P. J. Deren, Journal of Luminescence, 92(3), 229-235, (2001)
41. Cooperative processes in KYb(WO<sub>4</sub>)<sub>2</sub> crystal doped with Eu<sup>3+</sup> and Tb<sup>3+</sup> ions, W. Stręk, P. Deren and A. Bednarkiewicz, Journal of Luminescence, 87-89, 999-1001, (2000)
42. Efficient up-conversion in KYb<sub>0.8</sub>Eu<sub>0.2</sub>(WO<sub>4</sub>)<sub>2</sub> crystal, W. Stręk, P. J. Deren, A. Bednarkiewicz, Y. Kalisky and P. Boulanger, Journal of Alloys and Compounds, 300-301, 180-183, (2000)

## BOOK CHAPTERS

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- A.Bednarkiewicz and W.Strek, **Interaction of light and living matter** in "Photodynamic Therapy and Diagnosis" ed. H.Podbielska, A.Sieron and W.Strek, (in Polish) Urban&Partner 2003, 33-88
- **Active-Core-Active-Shell Upconverting Nanoparticles: novel mechanisms, features and perspectives for bio-labeling** Katarzyna Prorok, Dominika Wawrzyńczyk, Małgorzata Misiak, Artur Bednarkiewicz\*, Chapter 9, Upconverting Nanomaterials: Perspectives, Synthesis, and Applications, Ed. Claudia Altavilla ISBN 9781498707749, CRC Press Published October 10, 2016
- L. Marciniak, K. Kniec, K. Elzbieciak, and A. Bednarkiewicz, **Non-plasmonic NIR-Activated Photothermal Agents for Photothermal Therapy**, Chapter 14 in Springer Nature Switzerland AG 2019, A. Benayas et al. (eds.), Near Infrared-Emitting Nanoparticles for Biomedical Applications, [https://doi.org/10.1007/978-3-030-32036-2\\_12](https://doi.org/10.1007/978-3-030-32036-2_12)

## PATENTS APPLICATIONS

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- 2023** Polish patent application **P.445881** (23-08-2023) Element optyczny wykazujący lawinową emisję fotonów, jego zastosowanie i sposób przetwarzania informacji z wykorzystaniem tego elementu, **A.Bednarkiewicz**, M.Szalkowski, M.Majak, Z.Korczyk, M.Misiak (ILT&SR PAS)
- 2018** Polish patent application P.425031(27-03-2018) Sposób wysokorozdzielczego obrazowania fluorescencyjnego wykorzystujący nanoluminofory domieszkowane jonami lantanowców, zastosowanie sposobu do wysokorozdzielczego obrazowania fluorescencyjnego poniżej limitu dyfrakcji i układ pomiarowy realizujący sposób, **A.Bednarkiewicz** (Wroclaw Research Center EIT+)
- 2018** P.425598 (17-05-2018) Sposób detekcji biomolekuł oraz nanorozmiarowe znaczniki luminescencyjne, **A.Bednarkiewicz**, K.Prorok (WCB EIT+)
- 2017** PCT/PL2017/050015 - A luminescence detector for temperature measurement and a method of non-contact temperature measurement of the objects. - pending Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek
- 2016** P.416543 - Detektor luminescencyjny przeznaczony do pomiaru temperatury oraz sposób bezkontaktowego pomiaru temperatury obiektów - zgłoszony Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek
- 2016** Zgłoszenie patentowe P.416543 Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek, Wykorzystanie specyficznej kombinacji jonów do zastosowań w termometrii optycznej
- 2015** Sposób detekcji i selekcji komórek hybrydomalnych produkujących pożądane przeciwciała, PL413909, M.Skowicki, T.Lipinski, **A.Bednarkiewicz** (WCB EIT+)
- 2015** Zgłoszenie patentowe No PCT/PL2015/000080. Ł. Marciniak, D. Hreniak, **A. Bednarkiewicz**, W. Stręk Source of broadband white light generated on oxide matrices highly doped with rare earth ions, excited by infrared radiation
- 2015** WO2015178785A1 - Source of broadband white light generated on oxide matrices highly doped with rare earth ions, excited by infrared radiation Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek
- 2015** EP3146014A1 - Source of broadband white light generated on oxide matrices highly doped with rare earth ions, excited by infrared radiation - PENDING Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek
- 2015** US15312105 - Source of broadband white light generated on oxide matrices highly doped with rare earth ions, excited by infrared radiation - PENDING Ł. Marciniak, **A. Bednarkiewicz**, D. Hreniak, W. Strek
- 2010** European Patent Markers for protection valuable liquid and solid materials, International submission number 1600000729, PCT/PL2010050047

## PATENTS GRANTED:

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- 2009** Markers for protection valuable liquid and solid materials, PL patent granted P388780,

12.08.2009

- 2007** European Patent P-2795/MF, disclosure date 01-06-2007 "Method of fluorescence imaging"
- 2005** Polish patent P375249, disclosure date 20-05-2005, " A method of assessing the stage of development and spreading of cancer and a device to assess the stage of development and spreading of cancer"
- 2013** patent pt Sposób wysokorozdzielczego obrazowania fluoroscencyjnego oraz zastosowanie nanoluminoforów domieszkowanych jonami lantanowców do wysokorozdzielczego obrazowania fluoroscencyjnego, PL 226610 from 23.10.2013
- 2014** Patent No P.408282 Ł. Marciniak, D. Hreniak, A. Bednarkiewicz, W. Stręk, Źródło szerokopasmowego światła białego generowanego na matrycach tlenkowych wysoko domieszkowanych jonami metali ziem rzadkich, wzbudzanego promieniowaniem podczerwonym (21.05.2014)
- 2019** **patent NR 233598 (zgt.p..422277)** - Sposób bezkontaktowego optycznego pomiaru temperatury obiektów – zgłoszony, Ł. Marciniak, **A. Bednarkiewicz**
- 2021** Polish patent application P.437330 Układ pomiarowy oraz sposób do wyznaczania sprawności konwersji światła z zakresu VIS i NIR na ciepło w nanomateriałach koloidalnych, A.Paściak, **A.Bednarkiewicz**, Ł.Marciniak (**P.437330 – 17.03.2021, Patent no 2420221 granted 18.10.2022**)



## SCIENCE POPULARISATION

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- **4.2022** Four Lectures on Nano-bio-Technology (Introduction to nano-bio-technology, Applications of lanthanides in nano-bio-technology, superresolution imaging with lanthanides, biosensing with lanthanides) for Wrocław Doctoral School of Polish Academy of Sciences, Wrocław
- **2015-2019 Nano engineering at nanoscale the advantages of active-core-active-shell approach to design efficient up-converting nanoparticles** – wykłady w ramach "Letnie, Warsztaty Naukowe Niskie Łąki" in ILT&SR
- **2001, 2003, 2011, 2013, 2019** – lecturer during Festival of Science – Wrocław, Polska
- **2018** "Nanomedicine", lecture for Children University (8-10 years old children), Wrocław
- **2017** „Bariery w Zarządzaniu i Wdrażaniu Projektów Innowacyjnych” IX International Scientific Conference, Current problems in Management of Companies, Szczyrk, Poland, 23-25.06.2016 r., wykład proszony
- **2017** "A few words on being a scientist..." lecture during Academia Europea workshop, Wrocław
- **2017 "Scientific Night"** – experiments for Wrocław inhabitants
- **2016** "Nanomedycyna", lecture for UniKids-Uniwersytetu Dziecięcego (dzieci lat 12-15), Wrocław
- **2016** Widening European Participation: Polish and private perspective, warsztaty Komisji Europejskiej (European Research Council, Academia Europea, Young Academy of Sciences, COST, FET), Bruksela
- **06.2014** członek Young European Academy
- Współorganizator: · International Conference on Luminescence ICL'14 Wrocław (2014), · International Conference on f-elements (2005), · International Symposium on New Trends in Photodynamic therapy and Diagnosis (2004), · Rare-earth systems (2003), · Excited State of Transition Elements (2001), 21<sup>st</sup> International Conference on Dynamical Processes in Excited States of Solids (DPC, 2022, Wrocław, Poland)
- **2016** Chairman I główny organizator 1<sup>st</sup> European Conference and Spring School on Properties and Applications of Upconverting Nanoparticles (UPCON'16), Wrocław, Poland
- Członek Komitetu Naukowego **UPCON'16, UPCON'18, CTCT'17, UPCON'21**
- **2012-2018** The European Upconversion Network From the Design of Photon-upconverting Nanomaterials to (Biomedical) Applications – COST Action CM1403, 05.2014-05.2018 · polish representative, director of Short Term Scientific Mission (system grantowy COST), · designer and manager of the web page

## PRIZES:

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- 2022** prize from director of ILT&SR PAS for the most cited paper in 2021
- 2021** prize from director of ILT&SR PAS for the most cited paper in 2017-2020
- 2017** prize from director of ILT&SR PAS for the best scientific achievement in 2016
- 2017** prize from director of ILT&SR PAS for the most cited paper in 2013-2017
- 2015** prize from director of ILT&SR PAS for the best scientific achievement in 2014
- 2015** Broadband anti-Stokes white light source, from Ministry of Science and Higher Education, Poland
- 2006** winner in the 3<sup>rd</sup> Innovation Competition for the patent application, Technical University of Wrocław for the method and device for cancer detection and monitoring
- 2004** Gold Medal on the 53<sup>rd</sup> World Exhibition of Innovation, Research and New Technology – Brussels Eureka for the invention in the field of medical diagnosis
- 2004** Conference Grant from Towarzystwo Naukowe Warszawskie and Foundation for Polish Science
- 2004, 2005** Scholarship holder of Foundation for Polish Science
- 1996, 1997** Polish Minister of Education scholarship holder

## PRESENTATIONS AT UNIVERSITIES AND non-scientific MEETINGS:

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- 10.2023** Photon Avalanching Inorganic Luminescent Labels for (Bio)sensing, (super)resolution Imaging and reservoir computing, Chemistry Department, Technical University of Wrocław, Poland
- 06.2023** LAWINOWA EMISJA FOTONÓW W NANOMATERIAŁACH właściwości i zastosowania, 1st day of physics, Wrocław University, Wrocław, Poland
- 11.2022** Właściwości i biomedyczne zastosowania luminescencyjnych koloidalnych nanokryształów domieszkowanych jonami lantanowców, Uniwersytet Rzeszowski,
- 3.2022** Lawinowa emisja fotonów w nanomateriałach, seminar lecture in Department of Physics, Mikolaj Kopernik University, Torun, Poland
- 4.2021** Photon Avalanche emission in nanomaterials (WPPT seminar, Wrocław University of Technology, remote lecture)
- 2.2021** Photon Avalanche emission in nanomaterials (Scientific Club PHOTON, Wrocław University of Technology, remote lecture)
- 10.2020** Photon Avalanche emission in nanomaterials (ILT&SR PAS, remote lecture)
- 04.2020** Nanomateriały domieszkowane jonami lantanowców - właściwości, zastosowania i wyzwania, 04.2020 (Institute of Physics, PAS, Warsaw, remote lecture)
- 11.2016** "Widening European Participation - Young Academy of Sciences and private perspective", European Research Council Day - Academia Europea, Wrocław
- 06.2016** IX International Scientific Conference, Current problems in Management of Companies, Szczyrk, Poland, 23-25.06.2016 r., invited lecture "Barriers In Managing And Implementation Of Innovative Projects"
- 2014** Yb and Ho co-doped active-core-active-shell up-converting nanoparticles the impact of nano-architecture on spectral properties Invited lecture invited lecture in Chemistry Department, Turku University, Finland
- 2014** LANTHANIDE DOPED NANOPARTICLES optical properties, novel up-conversion mechanisms, bio-medical applications, invited lecture at Imperial College London, Great Britain
- 2013** Competitiveness and Innovation in the Context of FET London Great Britain

#### SCIENTIFIC PRESENTATIONS AT INTERNATIONAL CONFERENCES:

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- 2023** NOVEL FEATURES AND APPLICATIONS OF THE PHOTON AVALANCHE PHENOMENON, ESTE 2023 Conference, Świeradów-Zdrój, Poland (lecture)
- 2023** NOVEL FEATURES AND APPLICATIONS OF THE PHOTON AVALANCHE PHENOMENON, **keynote** lecture, Upconverting Nanoparticles Gordon Research Conference, Waterville Valley, USA
- 2022** NEW CONCEPTS OF SUBDIFFRACTION IMAGING AND SENSING WITH PHOTON AVALANCHE MATERIALS, SHIFT conference, Tenerife Island, **invited** talk
- 2022** PHOTON AVALANCHING : OLD PHENOMENON, NEW CHALLENGES, konferencja AMBRA, invited talk
- 2021** Photon avalanching at nanoscale: challenges and new possibilities, International Conference on Luminescence (ICL2020, 07.2021) (**invited** lecture)
- 2021** Photon Avalanche Upconverting Nanoparticles for biomedical applications, Artur Bednarkiewicz, UPCON2021 (2021), (lecture)
- 2019** NIR-NIR photon avalanche based luminescent thermometry with Nd<sup>3+</sup> doped nanoparticles, Artur Bednarkiewicz\*, Łukasz Marciniak, Karolina Elźbieciak, IS-OM8 (2019) (lecture)
- 2018** Photon avalanche in lanthanide doped nanoparticles, A.Bednarkiewicz, 11th International Conference on Nanophotonics, (www.icnp2018.org), Wrocław, Poland (**invited**) (2.07.2018)
- 2018** Superresolution imaging with Ln<sup>3+</sup> doped nanocrystals A.Bednarkiewicz, International Conference on RareEarth Materials REMAT 2018, Wrocław, Poland (**invited**)
- 2018** Super-resolution imaging with Ln<sup>3+</sup> doped nanocrystals, A.Bednarkiewicz, 2nd Conference and Spring School on Properties, Design and Applications of Upconversion Nanomaterials UPCON'18, Valencia, Spain (**invited**)
- 2017** Spectral shaping in active-core-active-shell up-converting nanoparticles the role of

- active-core@active-shell chemical architecture, A.Bednarkiewicz, SHIFT 2017, Tenerife Island, Spain (**keynote**)
- 2017** Shaping luminescent properties of up-converting  $\beta$ -NaYF<sub>4</sub> colloidal nanoparticles the role of Active-Core@Active-Shell chemical architecture, A.Bednarkiewicz, International Conference on Luminescence ICL 2018, Brasil (**keynote**)
- 2017** Quantitation of luminescent properties of Yb and Ho co-doped NaYF<sub>4</sub> colloidal nanoparticles - novel active-core-active-shell materials and novel characterization methods", A.Bednarkiewicz, CM1403 COST annual meeting, Aveiro, Portugal (lecture)
- 2017** Colloidal up-converting luminescent nanoparticles: new perspectives and applications, A.Bednarkiewicz, InterNanoPoland, Katowice, Poland, (**invited**)
- 2017** Up-conversion technology are all questions answered ?, A.Bednarkiewicz MRS 2017, Phoenix, USA (**invited**)
- 2016** with a lecture Upconverting nanoparticles for cancer theranostics, A.Bednarkiewicz, 2nd International Conference "Current Trends in Cancer Theranostics" June 19-23, 2016, Druskininkai, Lithuania (lecture +co-chairing)
- 2015** The impact of Active-Core@Active-Shell architecture on luminescent properties of Yb<sup>3+</sup> and Ho<sup>3+</sup> co-doped up-converting  $\beta$ -NaYF<sub>4</sub> colloidal nanoparticles, A.Bednarkiewicz, International conference IWASOM, Gdańsk (**invited**)
- 2015** The nano-engineering of efficient up-converting nanoparticles through active-core-active-shell approach, A.Bednarkiewicz, International conference CTCT2015: Current Trends in Cancer Theranostics. June 1-3, 2015, in Jena, Germany (**invited**)
- 2015** Luminescent nanoparticles for life sciences, A.Bednarkiewicz, Young Academy of Europe and Academia Europea Annual Meeting 2015, Darmstadt (**invited**)
- 2015** Hybrid solution for hybridoma selection, A.Bednarkiewicz, International conference on Rare-Earth Materials REMAT'15, Poland (**invited**)
- 2015** Nano engineering at nanoscale : the advantages of active-core-active-shell approach to design efficient up-converting nanoparticles, A.Bednarkiewicz, International Students conference PANIC, Wroclaw Univeristy of Technology, Poland (**invited**)
- 2014** Lanthanide doped active-core@active-shell nanoparticles: properties, applications and challenges, A.Bednarkiewicz, International Conference on Fluorescent Up-converting Nanoparticles: a Platform for Energy and Biomedical Applications, held from 4th to 6th June 2014, Torremolinos, Spain (lecture)
- 2014** Engineering optical properties of luminescent nanoparticles by active-core and active-/passive-shell approach A. Bednarkiewicz, B.Czaban, A.Pilch, D.Wawrzyńczyk, K.Prorok, M.Samoć, W.Stręk, at International Conference on Luminescence (ICL'14, Wroclaw) (lecture)
- 2014** The Photophysical Properties and Bio-Medical Applications of Up-Converting Nanoparticles at International Conferences on Laser Applications in Life Sciences, A.Bednarkiewicz, 2014 (LALS) w Ulm (**invited**)
- 2013** Up-converting nanoparticles in biology and medicine: properties and challenges Artur Bednarkiewicz, Dominika Wawrzynczyk, Marcin Nyk, Katarzyna Prorok, Anna Gnach, Małgorzata Misiak, Bartłomiej Cichy, Marek Samoc, Wiesław Stręk IMAMBioRA'13 (International Meeting on Advanced Materials for Bio-Related Applications) Wrocław Poland (**invited**)
- 2013** Up-converting nanoparticles in biology and medicine: properties and challenges Artur Bednarkiewicz, Dominika Wawrzynczyk, Marcin Nyk, Katarzyna Prorok, Anna Gnach, Małgorzata Misiak, Bartłomiej Cichy, Marek Samoć, Wiesław Stręk IWASOM '13 Gdansk Poland (lecture)
- 2013** Up-converting nanoparticles in biology and medicine: properties and challenges Artur Bednarkiewicz, D.Wawrzynczyk, Marcin Nyk, Katarzyna Prorok, Anna Gnach, Małgorzata Misiak Bartłomiej Cichy Marek Samoc, Wiesław Stręk EUROMAT 2013 European Congress and exhibition on Advanced Materials and Process Sevilla (**highlighted, invited**)

#### LIST OF MAJOR RESEARCH EXPEDITIONS:

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<b>2023</b>	Imaging of upconverting nanoparticles for DNA sequencing, Brno University, research visit, Czech Republic
<b>12.2014</b>	Imaging upconverting nanoparticles with confocal microscope, Department of Physics, Imperial College London, Great Britain
<b>10.2014</b>	Upconversion QY measurements, BAM Federal Institute for Materials Research and Testing, Division 1.10 Biophotonics, grupa prof. Ute Resch-Genger
<b>10.2013</b>	Nanoparticle Assisted Molecular Imaging and Sensing (NAOMIS), Universität Regensburg , Institut für Analytische Chemie, Chemo- und Biosensorik
<b>2008</b>	Gastroenterologische Molekulare Zellbiologie, Medizinische Klinik und Poliklinik B, Munster, Germany (1 week) – topic: autofluorescence <i>in vitro</i>
<b>2005-2008</b>	post-doc position in European Commission - Joint Research Centre, Institute for Health and Consumer Protection, Nanomaterials and Molecular Imaging, Ispra, Italy
<b>2002</b>	University of Turku, Department of Chemistry, Department of Inorganic Chemistry Turku, Finland (2 weeks) – topic: lanthanide doped glasses
<b>1998, 2001</b>	Institute of Physics, National Academy of Sciences of Belarus, Minsk, Belarus (2 weeks each), topic: laser diode pumped solid state lasers
<b>2000</b>	research in Arava Laser Laboratory, Ben Gurion University of Negev, Ber Sheva, Israel (June-September), topic: laser diode pumped ytterbium solid state lasers

#### PARTICIPATION IN JOB RELATED COURSES AND SCHOOLS:

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<b>Jul 2012</b>	International Summer School On Fluorescent Nano-Particles In Bio-Medicine, 16-20 July 2012, Miraflores de la Sierra, Madrid (invited speaker)
<b>Oct 2008</b>	<i>First Steps in Managing People, Scientific Writing, Public Speaking</i> courses, Ispra, Italy
<b>Jun 2007</b>	Biophotonics'07, 3rd International Graduate Summer School, Ven, Sweden
<b>Nov 2005</b>	<i>Principles and Applications of Time-Resolved Fluorescence Spectroscopy</i> 3rd European short course, Berlin, Germany
<b>Jan 2005</b>	IX School Of Pure and Applied Biophysics, Venice, Italy
<b>Jan 2002</b>	<i>20th Course: Frontiers of Optical Spectroscopy</i> , Ettore Majorana Center, Erice, Sicily, Italy

#### ORGANISATION OF INTERNATIONAL CONFERENCES:

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<b>April 2024</b>	UPCON, Scientific & steering committee
<b>Sep 2023</b>	co-chairman of nanobiophotonics session on European Biophysics Congress 2023
<b>Sep 2022</b>	co-chairman of DPC conference, Wroclaw, Poland
<b>May 2018</b>	Scientific committee of 2nd Conference and Spring School on Properties, Design and Applications of Upconverting Nanomaterials (UPCON'18), Valencia, Spain
<b>June 2016</b>	Scientific committee of Polish Scientific Networks 2016 Conference and chairman of Innovative technologies2x session
<b>June 2016</b>	Co-Chairman of 2 <sup>nd</sup> International Conference "Current Trends in Cancer Theranostics" Druskininkai, Lithuania
<b>May 2016</b>	Chairman and organizer of <i>1<sup>st</sup> Conference and Spring School on Properties, Design and Applications of Upconverting Nanomaterials (UPCON'16)</i>
<b>Aug 2014</b>	<i>International Conference on Luminescence (ICL, Wroclaw, Poland, organizing committee</i>
<b>Sep 2005</b>	<i>International Conference on f-elements, Szklarska-Poręba, Poland, organizing committee</i>
<b>Jun 2004</b>	<i>International Symposium on New Trends in Photodynamic therapy and Diagnosis, Wroclaw, Poland, symposium secretary</i>
<b>Jun 2003</b>	<i>Rare-earth systems, Ladek Zdrój, Poland, organizing committee</i>

**Jun 2001**      *Excited State of Transition Elements*, Ladek Zdrój, Poland, organizing committee

**SCIENTIFIC INTERESTS:**

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- Lasers and spectroscopy in medicine (hypespectral imaging, fluorescence lifetime imaging, photodynamic therapy, light dosimetry etc.
- Applications on nanocolloidal luminophores moped with lanthanide ions for bio-medical, bio-sensing and bio-imaging applications
- Cooperative energy transfer in (nano)cristals doped with lanthanides, photon avalanche, new materials doped with lanthanides for laser materials, microlasers, laser diode pumped solid state lasers

**NON-SCIENTIFIC INTERESTS:**

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- Music - a singer in Technical University Choir (1996 - 2000) and Medical University Choir (2000 - 2002), Wroclaw
- Art photography, mountain trekking, sport (volleyball, tennis), tourism, history of science