Special Recruitment to the Doctoral School of ILT&SR PAS in the Division of Optical Spectroscopy for PhD Student – Scholarship holder in the Research project DAINA 3 (NCN)

Institution: Doctoral School of ILT&SR PAS,

Institute of Low Temperature and Structural Research, Polish Academy of Sciences

Position: PhD student – scholarship holder in the NCN research project

Scientific discipline: **Chemical Sciences**

Date of announcement: 11.12.2025

Application deadline: 31.12.2025

Date of competition settlement: Recruitment results will be announced within 7 days after the end of the interviews.

Planned date of commencement of education and participation in the project: 01.02.2026

Link to DS of ILT&SR PAS website: https://phd.intibs.pl/en/

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Keywords: persistent luminescence; photoluminescence imaging; optically stimulated luminescence; quantum-cutting; cytotoxicity

Doctoral School of Institute of Low Temperature and Structure Research of the Polish Academy of Sciences (DS of ILT&SR PAS) announces a special recruitment for a PhD student – scholarship holder in the research project: ***"Persistent phosphors based on luminescent spinel nanocrystals exhibiting quantum-cutting effect for bio-imaging"***, carried out on behalf of the National Science Center DAINA 3 (grant no. UMO-2024/52/L/ST5/00102) in the Division of Optical Spectroscopy of the Institute of Low Temperature and Structure Research of Polish Academy of Sciences in Wroclaw.

Recruitment is conducted in accordance with the Rules of Recruitment to the Doctoral School of ILT&SR PAS

https://phd.intibs.pl/files/dokumenty_EN/25-04-29-Zasady_rekrutacji_SD_INTiBS_PAN_en.pdf

Requirements for the candidate

The application should include a filled application form at the link https://phd.intibs.pl/en/recruitment.html and presented in Polish or English:

- diplomas: matriculation or higher secondary school certificate, Bachelor's (engineering), Master's Degree diploma in chemistry, Physics, material engineering or related disciplines or an equivalent certificate of graduation or an official document from the applicant's university stating when the M.Sc. defense is due. The diploma should be provided before taking the oath (the commencement of education),

  [in the case of candidates who do not meet this condition: (1) a copy of the diploma of completion of first-cycle or third-year master's degree studies and (2) an application to the School Council for admission to recruitment, including a description of proven scientific achievement of the highest quality],

  In the case of obtaining a professional title M.Sc. outside the European Union - additionally originals of M.Sc. diploma and its transcript with grades, both certified with an apostille or authenticating (legalization) in the diplomatic representation of the Republic of Poland (in that country). Documents submitted without proper authentication will be considered as not meeting formal requirements.
- a duplicate (certified copy) of the entire grade book/Transcript of Records of the first- and second-cycle program (or full-cycle Master's degree program), or a supplement to the degree with grades from the entire course of study, or a student's grading report from all years of their studies confirmed by the Dean's Office, together with the calculated average grade from their studies;
- a certificate of English-language skills at B2 level or higher or information in the diploma supplement that the candidate completed an English course at the required level as part of the university program (if the supplement does not describe the level of the course, a certificate from the Dean's Office is required;
- a cover letter with an indication of the research topics within the framework of the research project;
- additional documents proving the candidate's suitability for scientific work (list of publications and conference presentations, list of completed courses and postgraduate studies, obtained language certificates, activity in scientific circles, etc.).

Doctoral Student Responsibilities

1. Implementation of an individual research plan, consistent with the research project; 2. Optimization of the synthesis of the undoped spinel powder samples and their structural, morphological and basic spectroscopic characterization; 3. Synthesis of the

single- and co-doped spinel powders, optimization of lanthanide ion concentration, and the structural, morphological, and spectroscopic studies of the samples; 4. Preparation, optimization and basic spectroscopic, including QC efficiency, measurements of colloidal solutions of undoped and doped spinel samples; 5. Covalent and non-covalent surface functionalization of undoped and doped spinel samples and their structural and spectroscopic characterization; 6. Verification of chemical stability, reproducibility and biocompatibility of functionalized nanophosphors; 7. Preparation of reports and scientific publications; 8. Participation in scientific conferences.

Scholarship

The doctoral scholarship will be paid a maximum of 4 years in the monthly amount of:

- 5,000 PLN (the amount will be reduced by the cost of mandatory social security contributions, etc., about 24%) until the month in which the doctoral student's mid-term evaluation at the doctoral school was conducted

- not lower than specified in the Law on Higher Education and Science and applicable executive regulations the amount will be reduced by the cost of mandatory social security contributions, etc., about 11%) after the month in which the student's mid-term evaluation at doctoral school was conducted

The scholarship will be paid after deduction of all components, in accordance with the applicable regulations and in accordance with the Act of 20 July 2018 Law on Higher Education and Science (Journal of Laws of 2024.10.24; 1571).

Joining the competition

Candidates wishing to enter the competition should submit all documents specified in the Rules of Recruitment to the Doctoral School of Institute of Low Temperature and Structure Research of the Polish Academy of Sciences.

https://phd.intibs.pl/files/dokumenty_EN/25-04-29-Zasady_rekrutacji_SD_INTiBS_PAN_en.pdf

Candidates' applications for admission to the School must be submitted by 31.12.2025

a) by email to the address phd@intibs.pl (preferred method of application); however, the original documents should be delivered before the studies start (a failure to meet this requirement will result in the candidate's name being removed from the list of doctoral students),

b) in person at the School's Secretariat Office at the Institute of Low Temperature and Structure Research of the Polish Academy of Sciences, 2 Okólna St. in Wrocław, from 9 am to 3 pm

Description of the research project and the PhD thesis

The primary objective of the project is to obtain and study a new class of nano materials, luminescent in the near infrared region, that combine two phenomena (1) so called persistent luminescence originating from pre irradiation of the material and occurring upon thermal and/or optical stimulation, and (2) quantum cutting light emission of two photons in a place of one excitation photon. The phenomenon of persistent luminescence (often referred to as delayed and long lasting luminescence or, confusingly, simply phosphorescence) is controlled by the slow, release of trapped charge carriers induced by thermal deexcitation , which leads to population of the excited states of the luminescent dopants. The resulting emission from the dopants is usually in the visible or near infrared light range. Depending on the type of host material, the dopants, the method of excitation, the use (or not) of photostimulation and the temperature changes, it can last from a few minutes to several hours after removal of the excitation source. I n such materials , with the combined persistent luminescence and quantum cutting the quantum efficiency thus could theoretically reach even 200%, while in classical phosphors exhibiting persistent luminescence it is well below 100%.This high efficiency in combination with possibility of producing photons in the near infrared range (in the biological window where most of the biological substances are transparent) is a promising approach to improve the performance of optical bio imaging. Such materials must, of course, be tested for their biocompatibility and be surface modified with the appropriate specific substances to achieve adequate selectivity in the chosen biological environment. The luminescent probes proposed in the project will allow working in the biological window, thus enabling deep tissue imaging, reducing phototoxicity and increasing contrast by circumventing autofluorescence, which is one of the main problems in analyzing specific emission signals from luminescent probes in the biological environment. Nanomaterials

obtained in this project with such promising luminescent properties, are highly desirable for future applications not only in biotechnology, but also potentially in other fields, such as security, for authenticating valuable objects or as luminescent solar concentrators in photovoltaic cells. .

Additional information

For additional information, please contact the project manager Prof. Dariusz Hreniak (e-mail: d.hreniak@intibs.pl, tel. +48 71 3954176).

Personal information

Candidates' personal data are collected and processed by the Institute of Low Temperature and Structure Research of Polish Academy of Sciences in Wrocław in accordance with the information on personal data processing available at https://bip.intibs.pl/artykuly/rodo-1