



HR EXCELLENCE IN RESEARCH



ADAM MICKIEWICZ UNIVERSITY, POZNAN

ANNOUNCE A COMPETITION

**for the position of [Postdoctoral Researcher](#)
at the Faculty of Physics
in the project**

[High-frequency mechanics of polymer-grafted nanoparticle metamaterials](#)

([METAGRAFT](#))

number [UMO-2023/51/B/ST3/01995](#)

Basic information

- 1. Research discipline (research field):** [PHYSICS](#)
- 2. Number of work hours per week including a task-based work schedule (if applicable):**
[Full-time position, 40h/week in a task-based work time system.](#)
- 3. Type of an employment contract and expected duration of employment:**
[Fixed-term contract for 3 years.](#)
- 4. Anticipated job starting date:**
[01.10.2024](#)
- 5. Workplace location:** [AMU Faculty of Physics](#)
- 6. Monthly salary:**
[Gros with the employer's cost: 11 666 PLN/month \(approx. 9 500 PLN/month\).](#)
- 7. Application deadline and process:**
[Electronic submission to \[bartlomiej.graczykowski@amu.edu.pl\]\(mailto:bartlomiej.graczykowski@amu.edu.pl\). Application deadline: 15.09.2022. Please note that the job reference number should be quoted in the application.](#)

8. Required documents

- Application form/letter of the candidate;
- *Curriculum Vitae (Max. 5 pages A4);*
- Diplomas or certificates issued by colleges and universities attesting to education and degrees or titles held (in case of academic degrees obtained abroad - the documents must meet the equivalence criteria set out in Article 328 of the Act of 20 July 2018 Law on Higher Education and Science (Journal of Laws of 2023, item 742 ; Polish: Dziennik Ustaw 2023 poz. 742 t.j.);
- Candidates who do not yet have a doctoral degree may apply if they plan to obtain it by the date of signing the employment contract.
- Information on the Applicant's research (publication record and list of conferences attended), teaching and organizational achievements,
- Other documents as determined by the competition committee.
- Consent to the processing of personal data as follows : *In accordance with Article 6 (1) (a) of the General Data Protection Regulation of 27 April 2016. (OJ EU L 119/1 of 4 May 2016) I consent to the processing of personal data other than: first name, (first names) and surname; parents' first names; date of birth; place of residence (mailing address); education; previous employment history, included in my job offer for the purpose of the current recruitment."*;

Conditions of the competition determined by the competition committee

I) Determination of qualifications: (researcher profile) according to the Euraxess guidelines

(R2) Recognised Researcher (PhD holders or equivalent who are not yet fully independent)

(definition of qualification level and professional experience according to Euraxess guidelines
<https://euraxess.ec.europa.eu/europe/career-development/training-researchers/research-profiles-descriptors>)

II) Job Offer description

Phonons-quanta of the lattice vibrational energy as other everyday particles, i.e., photons and electrons, are energy and information carriers. The research from the last decades has shown successful management of electromagnetic waves and electrons at the micro- and nanoscale, which was efficiently transferred into applications and devices operating in a wide range of energies. Similar efforts deployed, notably in the framework of an emerging field of nanophononics, attempt to achieve a comparable degree of control over GHz and THz phonons accounting for the hypersound and heat transport, respectively. The propagation of acoustic waves in the architected matter is a generic problem that impacts telecommunication, material, and life sciences. Phonon propagation in composite structures depends on many conversational parameters, increasing when anisotropy, confinement, and interfacial effects are included in the structure design. There is, therefore, rich, unexplored, and hardly predictable fundamental science that needs a foundation of high-frequency (GHz) phononics, enabling simultaneous manipulation of hypersonic phonons and visible light in periodic materials. The required sub-micrometer organization is a ubiquitous property of soft matter that allows the fabrication of structures with manifold functionalities. Control over the phonon dispersion can impact the flow of mechanical waves, strength, toughness concomitantly, and heat transport in dielectric hybrid materials.

One-component hybrid materials exemplified by polymer grafted (inorganic core) nanoparticles (GNP), newly synthesized, are a powerful platform for self-assembly fabrication of nano-submicron periodic structures. These combine strong vibration resonant core (size and elasticity), transformative polymer conformation, and phase state depending on physical (graft length, grafting density, and bimodality) and chemical (single, diblock) parameters. Furthermore, the facile fabrication of tunable GNP's structures with controlled solid (core)-polymer and polymer-polymer GNP interfaces will allow phonon

engineering at long and short wavelengths compared to the periodicity for scrutiny of structure-controlled mechanics and metamaterial properties.

In this project, we aim to investigate how the elasticity, photo-thermal effects, and hypersonic stopbands (all polarizations) can be tuned by architected GNP, discovering new metamaterial properties and ambient and high hydrostatic pressure. Establishing a reliable predictive power will open new application pathways of soft-matter-based high-frequency phononics.

To make this vision real, we will employ state-of-the-art GNP synthesis and experimental tools (e.g., Brillouin light scattering, frequency domain thermorefectance, and rheometry) in close international and multidisciplinary collaboration between five research groups from Poland, Germany, Spain, Greece, and the United States.

We will verify the research hypotheses: (i) High-frequency elasticity should deviate from a continuum-level behavior depending on graft conformation and GNP internal structure and packing. (ii) The subwavelength hypersonic stopband (hybridization) should display a complex dependence on grafting density, lattice constant, and architecture. (iii) The amplification of narrow-band metamaterial absorption in the visible regime and modulated thermal transport should relate to the phoxonic features of GNPs.

The advancement of a new field creates knowledge in physics and material engineering and challenges material nanofabrication and characterization: (1) Strong, robust, and low-density nanostructured functional materials are of paramount importance for a wide range of applications comprising microelectronic, photonics, nano-electro-mechanical systems, nanofluidics, biomedical imaging, GHz signal processing in 5G and 6G technologies. (2) A detailed understanding of phonon propagation in soft nanostructures is a precondition to accessing fundamental concepts such as micromechanics, tunable hypersonic phononic stopbands, heat management, and phonon-photon interactions. Controlling the elusive flow of heat is a complex challenge across multiple materials, length scales, and devices. The realization of performance enhancements reducing inorganic core content in one-component hybrid materials will have an environmental (recycling) impact. (3) Know-how transfer between the research groups and foremost to young scientists.

In particular, the postdoctoral researcher will be responsible for:

- Development of the experimental setup for Brillouin light scattering (BLS) experiments under high pressure.
- BLS evaluation of elastic properties of samples under varied external conditions.
- Day-to-day reporting, manuscript writing public dissemination of results.
- Collaboration with the project partners, short-term internships in Barcelona and Mainz.

III) Requirements and qualifications

The competition is open to individuals who meet the requirements specified in Article 113 of the Law on Higher Education and Science of 20 July 2018 (Journal of Laws of 2023, item 742, Article 113 as amended) and who meet the following requirements:

1. PhD in physical sciences or materials engineering.

2. Fulfilled formal requirements regarding the date of obtaining the doctoral degree in accordance with the regulations of the National Science Center https://www.ncn.gov.pl/sites/default/files/pliki/uchwaly-rady/2021/uchwala81_2021-zal1.pdf. Persons who do not have a doctoral degree may apply, provided they plan their defense no later than the date of signing the employment contract.

3. Proven experience in writing scientific publications.

IV) Required languages

1. Language: English
2. Level: fluent or native

V) Required research, teaching or mixed experience

- Proven experience in the field of laser spectroscopy.
- Experience in building optical systems.
- Independence, good organization of work, ability to work in a team.
- Experience in writing scientific publications and conference presentations.
- Knowledge of software such as: Matlab (or LabView), OriginLab, COMSOL, CorelDraw, LaTeX.
- Knowledge of solid state mechanics, polymer physics, heat transport and nanofabrication will be an additional advantage.

VI) Benefits

- ✓ an atmosphere of respect and cooperation
- ✓ supporting employees with disabilities
- ✓ flexible working hours
- ✓ funding for language learning
- ✓ co-financing of training and courses
- ✓ additional days off for education
- ✓ life insurance
- ✓ pension plan
- ✓ savings and investment fund
- ✓ preferential loans
- ✓ additional social benefits
- ✓ leisure-time funding
- ✓ subsidizing children's vacations
- ✓ "13th" salary

VII) Eligibility criteria

1. Matching of the candidate's scientific profile with the advertisement.
2. Number, scientific level of the candidate's scientific publications and conference presentations.
3. Grade on the diploma.
4. Internships and participation in research projects.

VIII) The selection process

1. Competition committee begins working no later than 14 days after the deadline for submission of documents.
2. Formal evaluation of submitted proposals.
3. Call to provide additional or missing documents if necessary.
4. Selection of candidates for the interview stage.
5. Interviews for candidates who meet the formal requirements.
6. The chair of the competition committee announces the results and informs the candidates. This information will include justification with a reference to candidates' strengths and weaknesses. Submitted documents will be sent back to candidates.

(Information about the planned stages of recruitment. Points 1-5 and 8 are mandatory)

IX) Prospects for professional development

- supervision in building a scientific profile through the publication in high-impact scientific journals,
- assistance in writing grant applications in domestic (FNP, NCN) and foreign (MSCA, Humboldt) research projects,
- establishing cooperation with renowned research centers in the world.

RODO Information Clause :

Pursuant to Article 13 of the General Data Protection Regulation of 27 April 2016. (Official Journal of the EU L 119 of 04.05.2016) we inform that:

1. The controller of your personal data is Adam Mickiewicz University, Poznań with the official seat: ul. Henryka Wieniawskiego 1, 61 - 712 Poznań.
2. The personal data controller has appointed a Data Protection Officer overseeing the correctness of the processing of personal data, who can be contacted via e-mail: iod@amu.edu.pl.
3. The purpose of processing your personal data is to carry out the recruitment process for the indicated job position.
4. The legal basis for the processing of your personal data is Article 6(1)(a) of the General Data Protection Regulation of 27 April 2016 and the Labour Code of 26 June 1974. (Journal of Laws of 1998 N21, item 94 as amended).
5. Your personal data will be stored for a period of 6 months from the end of the recruitment process.
6. Your personal data will not be made available to other entities, with the exception of entities authorized by law. Access to your data will be given to persons authorized by the Controller to process them in the performance of their duties.
7. You have the right to access your data and, subject to the law, the right to rectification, erasure, restriction of processing, the right to data portability, the right to object to processing, the right to withdraw consent at any time.
8. You have the right to lodge a complaint to the supervisory authority - the Chairman of the Office for Personal Data Protection, ul.Stawki 2, 00 - 193 Warsaw.
9. Providing personal data is mandatory under the law, otherwise it is voluntary.
10. Your personal data will not be processed by automated means and will not be subject to profiling.