



**Position title:** PhD Student in Physics

**Institution:** Department of Physics, Astronomy and Informatics Nicolaus Copernicus University in Toruń (Poland) / Interdisciplinary Doctoral School

**About you:** Nicolaus Copernicus University is internationally acclaimed for academic and research excellence. We encourage applications from students with the ability, enthusiasm, curiosity, and commitment needed to pursue further education, irrespective of their background. There are five doctoral schools at Nicolaus Copernicus University (NCU) which offer a unique experience to graduate students from all over the world, including the opportunity to conduct research with leading academics in state-of-the-art laboratories. The modern study programmes at the doctoral schools at NCU equip PhD students with the highest qualifications in a chosen scientific field and skills essential in high-profile research.

**Info project :** In this project two research area are planned: possible new findings on the physical understanding of heat transport in thin organic films and in terms of the technical implementation of Oleds or organic solar cells. The combination of photothermal infrared radiometry and thermorefectance measurement method in temperature range -200 C to 420 C allows to quantify how the thickness of a nanofilm affects its ability to conduct heat in different directions. Nanofilms are usually anisotropic on their thermal properties. The process of heat conduction is important in optoelectronic and photonic devices, where the polymer is one of the components. It should be mentioned that thermal management is important for the efficient operation of organic light-emitting diodes (OLEDs). Excess heat in OLEDs that is produced during their operation may accelerate their degradation and may cause an inhomogeneous brightness distribution, in particular in large area OLEDs. Assessing the quantitative impact of heat excess is difficult, because all decisive processes related to charge transport and emission via charge recombination are thermally activated. Decisive for OLED are the thermal effects that occur in the device layers outside the electrically active area. Therefore, the aim of the PhD thesis will be to focus on the parameters responsible for heat transport in the polymer, i.e. the thermal conductivity and the heat transfer coefficient. The heat transfer to the ambient environment is the key parameter to dissipate excess heat from the device. Moreover, it is worth to emphasis that the contribution of the layer and boundary resistance can be easily distiqwish using thermal wave methods.

**What is the position about and what responsibilities will the candidate have?**

- 1) Measurement skills using an unique optical experimental set-ups like photothermal infrared radiometry and thermorefectance;
- 2) Advanced data analysis, including:
  - analysis of experimental data,
  - selection of a suitable model for the prediction of thermal conductivity as a function of temperature.

- 3) Measurement skills for using tera-hertz spectroscopy and estimation dynamics properties of phonons in Bochum (Germany)
- 4) Writing the manuscripts

**Experience: What experience is required to do the job?**

Advanced knowledge of Matlab, as demonstrated e.g. by calculations carried out in your thesis  
advanced knowledge of the English language.

**Candidate qualities:**

- knowledge of Matrix method

**Requirements for the candidate:**

- Master degree in Physics, or Chemistry
- Motivation for work in thermal field
- Proficiency in spoken and written English.
- Advanced knowledge of Matlab

**Project PhD@NCU (STER):**

**Title of the project:** “Experimental and theoretical investigation of heat propagation in polymer nanolayers”.

**Supervisor:** dr hab. inż. Michał Pawlak, prof. UMK ( Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Poland).

**Supervisor:** Prof. Dr. Andreas Wieck (Ruhr University Bochum, Germany).

**Deadline for submitting offers:** 4 October 2021, 00:00

**Form of submitting offers:** email: [ster@umk.pl](mailto:ster@umk.pl)

**The conditions of employment:**

Stipend for 4 years in the amount of **4 266,00 PLN/month**.

**Scholarship:** PhD student stipend is available from **October 7th, 2021**.

**Additional information:** Ph.D. research project in a new formula of joint/double degree. The project will be conducted in the partnership with Ruhr University Bochum (Germany). Upon the successful completion of a unified and mutually approved study program student will earn a single diploma with the insignia of both institutions in considerably less amount of time. Work in a young, dynamic and international team.

**A candidate must submit:**

- a) CV (research experience, publications, projects, presentations, scholarships, awards)
- b) cover letter
- c) list of published research papers and documented participation in research projects.
- d) opinion about candidate from master thesis supervisor.
- e) information about previous doctoral studies or education at a doctoral school.
- f) a copy of the master's diploma or completion of graduate studies (or equivalent).
- g) if English is not the mother tongue or higher education studies were not conducted in English, a document confirming the knowledge of English at B2 level.
- h) declaration of selection of the project (available for download at <https://www.ac.umk.pl/nawa-ster/list-of-documents/>).
- i) declaration of selection of the Doctoral School within which the project will be implemented, (available for download at <https://www.ac.umk.pl/nawa-ster/list-of-documents/>).
- j) a statement that the candidate does not possess a doctoral degree (available for download at <https://www.ac.umk.pl/nawa-ster/list-of-documents/>).
- k) Statements of readiness to join the project and consent to the processing of personal data in connection with the implementation of the project (available for download at <https://www.ac.umk.pl/nawa-ster/list-of-documents/>).

**By submitting the application, a candidate agrees to the processing of her/his personal data in the recruitment process.**

