

Technische Universität Dresden (TUD) and Friedrich-Alexander Universität Erlangen-Nürnberg (FAU) have successfully established a Research Training Group on Planar Carbon Lattices (RTG2861-PCL) funded by Deutsche Forschungsgemeinschaft. We offer 14 positions as

Research Associate / PhD Student (m/f/x)

(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

starting **April 1, 2023** and comprising 75 % of the full-time weekly hours. The positions aim at obtaining further academic qualification (e.g. PhD). The employment contract is initially limited for 36 months, but ends prematurely at the end of the month, in which the last oral examination and the announcement of the overall result of the doctorate takes place. The period of employment is governed by the Fixed Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG).

As modern employers, TUD and FAU offer attractive working conditions to all employees, with the goal to promote and develop their individual abilities while empowering everyone to reach their full potential. We embody a university culture that is characterized by cosmopolitanism, mutual appreciation, thriving innovation and active participation. We commit to diversity and welcome all applicants who would like to commit themselves, their achievements and productivity to the success of the whole institution.

TUD and FAU strive to employ more women in academia and research. We therefore expressly encourage women to apply. Both universities are certified family-friendly employers, and TUD offers a Dual Career Service. We welcome applications from candidates with disabilities. If multiple candidates prove to be equally qualified, those with disabilities or with equivalent status pursuant to the German Social Code IX (SGB IX) will receive priority for employment.

About the Universities

Technische Universität Dresden (TUD), as a University of Excellence, is one of the leading and most dynamic research institutions in the country. Founded in 1828, today it is a globally oriented, regionally anchored top university as it focuses on the grand challenges of the 21st century. It develops innovative solutions for the world's most pressing issues. In research and academic programs, the university unites the natural and engineering sciences with the humanities, social sciences and medicine. This wide range of disciplines is a special feature, facilitating interdisciplinarity and transfer of science to society.

Friedrich-Alexander Universität Erlangen-Nürnberg (FAU) founded in 1743, is one of the largest research universities in Germany with more than 38,000 students. The five faculties cover the entire spectrum of modern academic disciplines – from humanities, social sciences and theology to medicine, law, economics, sciences and engineering. One of FAU's defining features is its commitment to interdisciplinary teaching and research that often goes beyond the boundaries of individual subjects.

About the RTG

RTG2861-PCL of TUD and FAU aims to achieve atomic-precision synthesis and exploration of new planar carbon lattices (PCLs) for next-generation quantum materials, functional precision membranes, optoelectronic and electrochemical devices, by employing advanced experimental and theoretical methods in an interdisciplinary approach bridging synthetic chemistry, condensed-matter physics, and materials science. The dual-site collaboration between TUD and FAU will establish the standard in research-based education in the field of PCL by combining our expertise in synthesis, function exploration, and theoretical description, and by exploiting the complementarity in laboratory equipment available at our institutions. Our research encompasses three research areas by exploring: (A) New approaches in precision synthesis of PCL, (B) PCLs' properties and functions, and (C) Experimental and theoretical tools for their description.

For detailed information about all 14 research topics, the principal investigators and the RTG2861-PCL qualification programme, the candidates should visit the RTG website (<https://rtg2861-pcl.chm.tu-dresden.de>) and/or contact the coordination office at (rtg2861-pcl@tu-dresden.de). All 14 positions, with their **project number** and **specific requirements** are listed below:

Position for project #**RTG2861-A1**

A1 Synthesis, structure and transport properties of 2D c-MOFs

Principal Investigator (Thesis supervisor): Dr. Renhao Dong (TUD)

Thesis topic: **Synthesis of multicomponent 2D c-MOFs with atomic precision**

Specific requirements: Experience with synthesis of conjugated molecules and 2D MOFs or construction of vdW heterostructures and the related devices for investigating interface-transport properties.

Position for project #**RTG2861-A2**

A2 Bottom-up synthesis of topological GNRs

Principal Investigator (Thesis supervisor): Prof. Dr. Xinliang Feng (TUD)

Thesis topic: **Synthetic strategies and methods for topological GNRs with heteroatom doping and non-hexagonal rings**

Specific requirements: Expertise in the bottom-up organic/polymer synthesis and characterization of large aromatic compounds, graphene molecules or nanoribbons

Position for project #**RTG2861-A3**

A3 Covalent patterning of graphene

Principal Investigator (Thesis supervisor): Prof. Dr. Andreas Hirsch (FAU)

Thesis topic: **Laser induced patterning of graphene**

Specific requirements: Experience in synthetic organic chemistry and basic insights into modern spectroscopic and microscopic methods.

Position for project #**RTG2861-A4**

A4 Precursor-derived printing of PCL electroadsorption devices

Principal Investigator (Thesis supervisor): Prof. Dr. Stefan Kaskel (TUD)

Thesis topic: **Synthesis of 2D carbon materials from highly reactive precursors**

Specific requirements: Knowledge in the field of materials synthesis and characterization is advantageous. The candidate is expected to have expertise or quickly become familiar with powder X-ray diffraction, SEM and electrochemical characterization techniques.

Position for project #**RTG2861-A5**

A5 Formation and functionalization of PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Hans-Peter Steinrück (FAU)

Thesis topic: **Metal-coordinated porous structures on metal surfaces**

Specific requirements: Experience in/with ultrahigh vacuum-based surface science, scanning tunneling microscopy and or X-ray photoelectron spectroscopy.

Position for project #**RTG2861-B1**

B1 Self-assembled device structures and unique PCL-structures

Principal Investigator (Thesis supervisor): Prof. Dr. Marcus Halik (FAU)

Thesis topic: **Devices of PCLs grown on SAMs**

Specific requirements: Experience in/with semiconductor processing (PVD, CVD, lithography) and electrical characterization of devices

Position for project #RTG2861-B2

B2 Structural, electronic, and vibronic topology in PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Thomas Heine (TUD)

Thesis topic: **Topological GNRs and patterned graphene with large gap**

Specific requirements: Experience in theoretical chemistry or theoretical physics (solid state), electronic structure calculations, scientific computing and solid background in mathematics

Position for project #RTG2861-B3

B3 On-surface synthesis and electronic structure of topological PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Sabine Maier (FAU)

Thesis topic: **Topological GNRs: On-surface synthesis and electronic structure**

Specific requirements: Interest in surface physics/chemistry and high-resolution low-temperature scanning probe microscopy and spectroscopy

Position for project #RTG2861-B4

B4 Physics of planar carbon tunnel junctions

Principal Investigator (Thesis supervisor): Prof. Dr. Heiko Weber (FAU)

Thesis topic: **Multi-observable investigation of electron tunnelling**

Specific requirements: Experience in experimental solid-state physics

Position for project #RTG2861-C1

C1 *In situ* and solid-state NMR spectroscopy of PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Eike Brunner (TUD)

Thesis topic: ***In situ* NMR spectroscopy of electroadsorption processes**

Specific requirements: Strong interest and background in physical chemistry, desirable would be experience with analytical techniques, especially spectroscopy.

Position for project #RTG2861-C2

C2 Accurate prediction of satellite features in core-level spectra of PCLs

Principal Investigator (Thesis supervisor): Dr. Dorothea Golze (TUD)

Thesis topic: **Development of the GW+C method for core levels**

Specific requirements: We are looking for a motivated candidate, preferentially with theoretical background and strong interest in electronic-structure theory and code development. Basic programming skills are expected.

Position for project #RTG2861-C3

C3 Multidimensional (1D and 2D) spectroscopy of charge carriers within PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Dirk Guldi (FAU)

Thesis topic: **Excitons, biexcitons, trions and their trapping in PCLs**

Specific requirements: Experience in time-resolved spectroscopy and data analysis by means of Glotaran

Position for project #RTG2861-C4

C4 Optical and vibrational signatures of structural and electronic topology in PCLs

Principal Investigator (Thesis supervisor): Prof. Dr. Janina Maultzsch (FAU)

Thesis topic: **Vibrational signatures of edge topology in novel GNRs**

Specific requirements: Experience with optical spectroscopy and low-dimensional materials, strong background in solid-state physics, interest in numerical simulations.

Position for project #**RTG2861-C5**

Project: **Electrochemistry of PCLs probed by operando vibrational spectroscopy**

Principal Investigator (Thesis supervisor): Prof. Dr. Inez Weidinger (TUD)

Thesis topic: **Operando spectroelectrochemistry of printed PCL electrodes**

Specific requirements: Experience in electrochemistry and/or vibrational spectroscopy would be desirable.

General requirements

- very good university degree (M.Sc. or equivalent) in chemistry, physics, or materials sciences; Specialization in synthetic chemistry, physical chemistry, theoretical chemistry/physics, condensed-matter physics or nanosciences;
- excellent results on individual performance criteria (e.g., manuscript/publication resulting from Master thesis, awards) and timely completion of higher education;
- strong motivation to independently conduct research and to work in interdisciplinary collaborations;
- excellent written and verbal communication skills in the English language;
- one-page **motivation letter** specifying your reasons for joining our team, which two of the fourteen topics of the RTG2861-PCL you are most interested in and why, and your preferred supervisor. Please visit <https://rtg2861-pcl.chm.tu-dresden.de> for information about all fourteen research topics and thesis supervisors in this RTG;
- **letter of recommendation** from the supervisor of the master thesis.

What we offer

- cutting-edge research and training in the field of advanced nanomaterials with focus on PCLs beyond the state of the art;
- a dedicated supervision concept with a dual mentoring strategy of TUD and FAU (supervisor and co-supervisor from the partner university);
- a modern, interdisciplinary, and international working environment in two of Germany's most vibrant cities;
- dual-site research and training facilitated by a virtual research environment (VRE) where digital classes are combined with online tools to share information and research data;
- a comprehensive qualification program incorporating digital/hybrid lectures, weekly seminars (hybrid and on-site), lab rotations and hands-on training;
- annual summer/winter schools and complementary skills workshops.

Both Dresden and Erlangen are student cities offering vibrant cultural life and good living conditions.

Application

Please submit your comprehensive application (in English or German) including

- Curriculum vitae (CV),
- One-page motivation letter as described in the **General requirements**,
- Master/diploma certificate and transcript of grades (i.e. the official list of coursework including your grades) and
- Letter of recommendation from the supervisor of your master thesis (and, if available, a link to your Master's or diploma thesis).

preferably via the TU Dresden SecureMail Portal <https://securemail.tu-dresden.de> by sending it as a **single pdf-document** quoting the project number(s) **RTG2861-Xx** (see above) in the subject header

to rtg2861-pcl@tu-dresden.de. You can also send your application by mail to: **TU Dresden, Fakultät Chemie und Lebensmittelchemie, Professur für Theoretische Chemie, z. Hd. Frau Dr. Nina Vankova, Helmholtzstr. 10, 01069 Dresden, Germany.** The closing date for applications is **February 03, 2023** (stamped arrival date of the university central mail service applies). The recruitment process will continue until the positions are filled and applications after the deadline may be also considered. Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.

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concept



Reference to data protection: Your data protection rights, the purpose for which your data will be processed, as well as further information about data protection is available to you on the website: <https://tu-dresden.de/karriere/datenschutzhinweis>.