

UNIVERSITY OF DUISBURG-ESSEN:

Information for Applicants
for the W2-Professorship

Inorganic Chemistry
in the Faculty of Chemistry

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I. The University of Duisburg-Essen

Open minded! We are one of the youngest universities in Germany and think in terms of possibilities instead of limits. In the heart of the Ruhr metropolis, we develop ideas with a future at eleven faculties. We are strong in research and teaching, live diversity, promote potentials and are committed to an educational justice worthy of the name.



A view of the Essen Campus. More impressions at:
www.uni-due.de/en/impressions-essen-campus.php

The University of Duisburg-Essen (UDE) - one of the youngest and largest universities in Germany - is located in the middle of the Ruhr Metropolitan Region. Its broad spectrum of subjects ranges from humanities, social sciences and education to economics, engineering, natural sciences and medicine. Since its foundation in 2003, the UDE has developed into a globally recognized research university. This is documented by the international top positions it has achieved in the meantime. In a comparison of the best universities founded after the turn of the millennium, the UDE ranks fourth worldwide. In the Times Higher Education (THE) Young University Ranking, it ranks 19th among the top 250 international universities that are less than 50 years old. The UDE is also far ahead when it comes to citations of scientific publications: It ranks fifth nationwide and 97th in the World University Ranking (THE) in an international university comparison.

Profile focus

The UDE's range of services is broad and includes, among other things, the interdisciplinary profile focusing on nanosciences, biomedical sciences, urban systems, water research and the transformation of contemporary societies. Another central field of research is lifelong educational and socialization processes.

Digitally supported teaching and learning concepts

Through innovative and digitally supported teaching and learning concepts, the UDE is an attractive place for research-based teaching. It offers its more than 42,000 students from over 130 nations almost 250 courses of study, 127 of which are teacher training courses.

Educational justice

The UDE is regarded as a nationwide model of how educational justice can be implemented at a university. Numerous measures and projects promote young talents with prospects. The UDE sees itself as a lively place of diversity and openness, where students, researchers and employees can develop their potential and willingness to perform. The aim is to achieve a broadly anchored resource-saving development.

Partnerships & Cooperation

The UDE has a strategic partnership with the Ruhr University Bochum and the Technical University Dortmund as part of the University Alliance Ruhr (UA Ruhr). They cooperate closely in research and teaching and are jointly present on three continents with their own branch offices as well. In addition, the UDE maintains partnerships with over 100 universities around the world.

II. The Faculty of Chemistry

The Faculty of Chemistry is located on the Essen campus, where it has modern laboratories and offices in a chemical research building completed in 2008. There are currently eight different research fields covered by 25 professors, 70 regular academic staff members (plus roughly 90 full time employment equivalents from external funding) and 80 employees in technical and administrative services. The research fields are: Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Theoretical Chemistry, Technical Chemistry, Analytical Chemistry, Environmental microbiology and Biotechnology, and Chemistry Education. The Faculty is currently one of the largest Faculties of Chemistry in Germany, with about 2,000 students and almost 400 doctoral students, who are roughly divided equally over the three courses of study in chemistry, water science and teaching. Every year, about 50 young scientists, not only from chemistry, but also from physics, biology, engineering, and educational studies, finish their doctorates here successfully. The Faculty also cooperates closely with the surrounding universities of applied sciences in Krefeld and Gelsenkirchen.

The Faculty represents the entire breadth of chemical research, from pure basic research to more application-oriented research, such as in our two associated institutes, the German Textile Research Center Northwest (DTNW) in Krefeld and the Rheinisch-Westfälische Institut für Wasserforschung (IWW) in Mülheim. Close research collaborations at all levels also exist with the neighboring Max Planck Institutes in Mülheim (Coal Research and Chemical Energy Conversion) and Dortmund (Physiological Chemistry). In addition, scientists from these institutions work as honorary professors and private lecturers at our faculty.

The Faculty actively participates in three of the five profile focus areas of the UDE. Activities in the area **Biomedical Sciences** are bioorganic and supramolecular chemistry, biomaterials research, drug development and release as well as biophysical chemistry. Here, in particular working groups from the fields of organic, inorganic, and physical chemistry are involved, which are also active in the Center for Medical Biotechnology (ZMB). This research area is also reflected in teaching in the Master's program Chemistry with the specialization Medical-Biological Chemistry. Scientists of our faculty cooperate in a wide range of joint projects with colleagues from biology and medicine. Particularly noteworthy is the Collaborative Research Centre 1093 *Supramolecular Chemistry of Proteins*, which runs since 2014 and whose third funding period has just been applied for. The interdisciplinary focus **Nanoscience** receives contributions from colleagues from the fields of inorganic chemistry, organic chemistry, physical chemistry, technical chemistry and theoretical chemistry. These scientists work on numerous topics in the areas of surface chemistry and functionalization, Nano-materials research, soft materials, self-assembly and self-organization, supramolecular chemistry and crystallography. Faculty members are actively engaged in the Center for Nanointegration Duisburg-Essen (CENIDE) and the NanoEnergyTechnik-Zentrum (NETZ) in Duisburg, together with colleagues from physics and engineering. In the NETZ building there are opportunities for temporary infrastructure use for research projects in fitting areas. In the fields of heterogeneous catalysis and energy research, the Faculty closely cooperates with the Max Planck Institutes for Chemical Energy Conversion and for Coal Research in Mülheim/Ruhr and with partners at the Ruhr-Universität Bochum. The Faculty of Chemistry of the UDE manages the Collaborative Research Centre / Transregio 247 *Heterogeneous Oxidation*

catalysis in the liquid phase, which has been running since 2018, and which bundles the aforementioned regional competences. In close collaboration, the participating scientists study new catalysts for, among others, electrolysis of water that can help to store effectively regenerative electrical energy in the form of synthetic chemical fuels. Members of the Faculty are also involved in CRC 1242 *Non-Equilibrium Dynamics of Condensed Matter in the Time Domain* and CRC/TRR 270 *Hysteresis design of magnetic materials for efficient energy conversion*. Finally, a Faculty member leads SPP 2122 *Materials for Additive Manufacturing*. A further new research building ACTIVE SITES - Center for Method Development to Study Active Sites in their Functional Aqueous Environment is been approved by the state of North Rhine-Westphalia and is currently being applied for.

Due to the special importance of water as a liquid reaction medium in CRC/TRR 247 and ACTIVE SITES, this area offers fruitful connections to the rather new UDE research focus of **Water research**. The Faculty's major participation currently comes from the working groups in analytical and technical chemistry as well as from environmental microbiology and biotechnology. Chemists are active as board members in the Centre for Water and Environmental Research (ZWU) and as directors of the IWW Water Centre in Mülheim an der Ruhr, an affiliated research institute to UDE. The scientific work focuses mainly on microbial processes in aquatic systems, water quality management, new water technologies and the tracking of hazardous substances in the environment. Members of the Faculty are substantially participating in the CRC 1439 *Multilevel response to stressor increase and release in stream ecosystems* recently established in the Faculty of Biology. Since 2014, the state of North Rhine-Westphalia has granted the Research Training Group *Future Water*, and recommended funding for the construction of a new research building in Essen, which was achieved with a significant participation of the Faculty of Chemistry.

Another research area of the Faculty is empirical research in chemistry education. Currently, the colleagues are involved in a network of 5 projects with funding from the German Research Foundation (DFG) and have recently completed a BMBF-funded research project. The group deals with the reasons for academic success and dropout in the entry phase of scientific-technical courses of study and possible interventions. All professors of chemistry education are members of the Interdisciplinary Center for Educational Research IZfB and the Center for Teacher Education (ZLB), which coordinates the Research Training Group on Cross-Sectional Issues in Teacher Education and School and Instructional Development (GKqL), which was established in April 2019 with significant participation of the Faculty of Chemistry.

The Faculty's research is substantially supported by external funding. Third-party fundraising has been steadily increasing in recent years and has now stabilised at a high level (more than 9 million € faculty-wide).

Many of the research activities outlined above are highly interdisciplinary, which is why almost all working groups of the Faculty, as already pointed out, cooperate intensively with scientists from other Faculties of our university (especially biology, medicine, physics, engineering and educational sciences) as well as with other research groups at home and abroad.

Young researchers of the Faculty have been very successful in competitive programs in the past years, including the DFG Heisenberg Program; BMBF early-career research groups; and the academic returnee program of the state of North Rhine-Westphalia.

With Evonik Industries exists a strategic partnership, in which Evonik funds collaborative research projects and sponsors events at the Faculty. The Werdelmann foundation currently funds a junior professorship and positions for outstanding PhD students at the Faculty.

The Faculty of Chemistry offers the following study programs:

- Consecutive Bachelor/Master program Chemistry, with optional specialization in Medical-Biological Chemistry
- Consecutive Bachelor/Master program Water Science, with emphasis on Chemistry, Analytics and Microbiology
- Consecutive Bachelor/Master program Chemistry for teachers
- Consecutive Bachelor/Master program Biotechnology for teachers
- Consecutive Bachelor/Master program Science Teaching at primary schools

The accredited Bachelor/Master's degree program ensure a Europe-wide comparability of the diplomas (Bachelor of Science, B.Sc. and Master of Science, M.Sc.), also in the sense of the Europe-wide recognition as Eurobachelor. Of course, the academic achievements are calculated in ECTS credits. In 2017, after the introduction of system accreditation, the first external institutional evaluation took place, which certified the department a high quality in teaching and an internationally visible research strength.

Our Faculty values particularly high-quality teaching: feedback from students on lectures and seminars is regularly evaluated, and is taken into account for the further development of the teaching offerings. In the first semesters, the prospective scientists and teachers particularly are supervised intensively in tutoring and mentoring groups. The practical training in the basic studies takes place in newly established, modern laboratories, while in the specialization courses a closer connection to the research working groups is encouraged. Even within the scope of the bachelor's degree program, students typically get in touch with research-relevant topics from the fifth semester onwards. In the master's degree program, early involvement in research is a clear focus of UDE's chemistry curriculum.

In the field of recruiting young talents, the Faculty of Chemistry offers a number of events for high school students. Outstanding high school students can already attend the basic lectures during their school years and obtain proof of achievement for their later studies. The Faculty continues to participate in the Summer University and offers a highly sought-after trial study of chemistry with well over 100 participants in recent years. The Student Experimental Internship (SEPP), set up by the Faculty of Chemistry and available to lower secondary school classes once a week, is already booked out for months in advance.

Furthermore, on an individual basis a variety of activities take place in cooperation with schools and the interested public, e.g. lectures by lecturers on site in schools, support in experimental and project work, visits of school classes at the university or the organization of open days.

III. Center for Nanointegration Duisburg-Essen (CENIDE)

Nanoscience and nanotechnology form one of the five research priorities of the UDE. Research and teaching in this field are coordinated by CENIDE. CENIDE was founded in 2005 and today

connects more than 70 members and their working groups in the fields of physics, chemistry, electrical engineering, mechanical engineering, and process engineering as well as biology and medicine. With more than 400 doctoral students, CENIDE is one of the most important research units for nanotechnology and materials science in Europe and plays a leading role in the combination of basic research and applied materials science for the profile focus *Materials Chain* of the University Alliance Ruhr (UA Ruhr, together with the Ruhr-Universität Bochum and the Technical University Dortmund). Research at CENIDE focuses on the areas of catalysis, dynamic processes in solids, gas phase synthesis of nanomaterials, magnetism, nanomaterials for health, and nanotechnology in energy applications. Under the coordination of CENIDE, the research building "NanoEnergieTechnikZentrum" (NETZ) was established at the campus in Duisburg. In addition to many research projects, NETZ also houses the DFG core Facility *Interdisciplinary Center for Analytics at the Nanoscale* (ICAN), which offers CENIDE researchers a wide range of complementary characterization methods.

IV. The Collaborative Research Center/Transregio 247 "Heterogeneous Oxidation in the Liquid Phase" and the Collaborative Research Centre CRC 1093 "Supramolecular Chemistry on Proteins"

The **CRC/TRR 247** is a DFG-funded research network of the UDE (Speaker University) and the neighboring Ruhr-Universität Bochum, which was established in 2018. Further participating institutions are the Max Planck Institutes for Chemical Energy Conversion and for Coal Research both located in Mülheim/Ruhr as well as the Fritz Haber Institute in Berlin. In 21 sub-projects from the disciplines of chemistry, physics and engineering, the fundamentals of heterogeneous oxidation catalysis in the liquid phase are explored. The aim is to clarify the active centers and reaction mechanisms for selected oxidation reactions in thermal, electro- and photocatalysis. For this purpose, iron-cobalt mixed oxides with spinel and perovskite structure-type are synthesized, extensively investigated, and their catalytic reactivity is linked to the results of materials characterization in structure-activity relationships. Therefore, the CRC develops new experimental and theoretical methods in order to understand the dynamics of the catalyst surface in the liquid reaction medium on the atomic scale. A special focus lies on the clarification of the role of structural defects and microstructural properties for activity and selectivity in heterogeneous catalysis.

The **CRC 1093** aims at a deeper understanding of the underlying principles of protein recognition and functional modulation by supramolecular ligands. Combining different expertise from synthetic and supramolecular chemistry, molecular and cell biology with computational chemistry, bioinformatics and structural biology provides a highly interdisciplinary research environment for this endeavor. Chemists develop novel concepts for protein recognition and modulation by supramolecular ligands.

V. Inorganic Chemistry in Essen

The W2-Professor "Inorganic Chemistry" will be part of the inorganic chemistry division, which is currently represented by two C4/W3 professors (Prof. Matthias Epple and Prof. Stephan Schulz) and one W1tt professor (Prof. Kai Exner). The Epple group focuses primarily on the synthesis and functionalization of inorganic nanoparticles as well as the synthesis and structural characterization of metallic and bimetallic nanoparticles. Additional focal points are the development and application of biomaterials such as microstructured polymers or calcium phosphate ceramics in close collaboration with colleagues from the faculty of Medicine. In other projects,

the biomimetic crystallization of inorganic materials and biogenic minerals from biology and medicine (“biomineralization”) as well as the reactivity of solids is investigated. Research in the Schulz group focuses on the synthesis, structure and reactivity of organometallic compounds and their conversion into nano-scale materials. The synthesis and reactivity of low-valent main group elements in metal-organic compounds is of particular interest. The material synthesis focusses on the deposition of thin films by gas phase processes as well as on nanoparticles by wet chemical methods in organic solvents as well as in ionic liquids. Of particular interest are metal oxides and the development of structure-activity relationships in electrocatalysis. The Exner group is specialized in the theoretical investigation of inorganic electrode materials (mixed-metal oxides, transition-metal oxides, MXenes) for application in electrolyzers, fuel cells, or batteries. The oxygen evolution reaction is in the center of the current research activities, but also the chlorine evolution, hydrogen evolution, and oxygen reduction reactions are described by modern theoretical methods. While there is a focus on the application and development of high-throughput screening techniques and multi-scale modeling approaches to resolve mechanistic pathways, microkinetic approaches are applied to build a bridge between experiment and theory.

VI. Requirements for the Position “W2-Professorship in Inorganic Chemistry”

a. Position Announcement

Candidates should show an excellent teaching record. Participation in teaching is expected in the field of inorganic and general chemistry in all curricula of the Faculty of Chemistry in both the Bachelor's and the Master's degree course in Chemistry (BSc, MSc, LA) and Water Science (BSc, MSc). In addition, an excellent track record in a modern and actual research field in inorganic chemistry with particular focus on either functional materials, metal organic chemistry, catalysis or bioinorganic chemistry with international visibility is expected. The willingness to participate in interdisciplinary research consortia and in the academic self-administration is expected. Furthermore, experience in successful grant application of interdisciplinary, ideally DFG-funded, collaborative research projects is desired.

b. Additional Information on the announced position

Appropriate lab and office space at the campus in Essen are ensured and located at the Essen campus on the third floor in building S07 with modern infrastructure.

This professorship is attributed with the normal teaching deputation of 9 hours per week per semester. Full commitment to teaching in inorganic chemistry in chemistry and related subjects at all levels and full width is expected. Initiatives for new didactic concepts and innovative teachings formats in lectures, seminars and practical training are particularly welcome.

Details of the endowment of the position (staff, rooms, budget, infrastructure) will be presented to the invited candidates in person and shown during the inspection of the corresponding labs and offices.

The Faculty of Chemistry has several central analytical service units (including nuclear magnetic resonance spectroscopy (NMR), mass spectrometry (MS), electron microscopy, elemental analysis, X-ray diffraction and polymer characterization) which can be used in addition to the facilities at the campus in Duisburg (NETZ, ICAN).

VII. Legal Framework

With the passing of the Higher Education in North-Westphalia Act (German abbreviation: HG) dated 16.09.2014, the university system was restructured as of 1 October 2014. Operating under German law, the universities are defined legally as public corporations supported by the State of North Rhine-Westphalia. State funding is based on the tasks of the universities, agreed goals and performances delivered. They have a global budget and are not subject to the instructions of the responsible North Rhine-Westphalian Ministry.

Assuming legal prerequisites are met, professors in Germany are usually employed unlimited on a civil-servant basis (= full tenure). However, employment based on a contract under private law is also possible. For further information (laws, directives etc.), please visit https://www.uni-due.de/verwaltung/organisation/peo_professoren.php (in German).

VIII. Salary

The W salary scale provides a system of base salaries (W1, W2, W3) for professors in Germany. The basic salaries are age-independent and can be increased for W2 and W3 by allowances (bonuses). This is generally not possible for W1 positions. Such performance-related salary components in W2 and W3 positions can be awarded on the occasion of appointment and tenure negotiations (**appointment and tenure bonuses**), for special achievements in research, teaching, art, further training and promotion of young scientists (**special performance bonuses**) and for carrying out functional or special responsibilities within the framework of university self-management or university administration (**functional performance bonuses**). Under certain circumstances, so-called research and teaching allowances may be paid out of funds provided by private third parties. Within the framework of appointment negotiations, any temporary appointment-related performance bonuses are linked to an individual goal agreement. The remuneration in case of appointments will be negotiated individually with the Rector of the University of Duisburg-Essen.

The currently effective base salaries for grades W1, W2 and W3 in North Rhine-Westphalia can be found at:

<http://www.lbv.nrw.de/beztab/beso.php>. (in German)

Information and legal bases on W-salary (NRW) can be found at:

https://www.uni-due.de/verwaltung/organisation/peo_links.php (in German)