UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Information for applicants for the W3 professorship

Technical Chemistry – Technical and Macromolecular Chemistry for Water Research

at the Faculty of Chemistry

Table of contents

I. The University of Duisburg-Essen: Open-Minded

We are one of the youngest universities in Germany and think in terms of opportunities rather than limitations. In the heart of the Ruhr metropolis, we develop ideas with a future at 11 faculties.
We are strong in both research and teaching and consider diversity an integral part of our culture as we promote potential and are committed to upholding genuine equity in education.

A view of the Essen campus. Please find further images at:
https://www.uni-due.de/en/impressions-essen-campus.php

Located in the heart of the Ruhr metropolis, the University of Duisburg-Essen (UDE) is one of the youngest and largest universities in Germany. The courses range from the humanities and social sciences via economics and business studies all the way to the engineering sciences and natural sciences (including medicine). The University has also established itself firmly in the international scientific community since being founded in 2003.

This is reflected by the top positions UDE has recently achieved in international rankings. In a comparison of the best universities founded after the turn of the millennium, UDE ranks fourth worldwide. In the Times Higher Education (THE) Young University Ranking of 2022, the UDE is ranked 29th, second in Germany. UDE is also well ahead when it comes to citations of scientific publications: it ranks fifth nationwide and 97th in the international comparison of the THE World University Ranking.

The research carried out at UDE covers a broad spectrum including five cross-departmental strategic research areas: Nanosciences, Biomedical Sciences, Urban Systems, Transformation of Contemporary Societies and Water Research. Lifelong learning and socialisation processes are another central field of research.

Thanks to digitally supported teaching and learning concepts, UDE is an attractive location for research-based teaching. More than 42,000 students from over 130 countries are enrolled at UDE in a total of almost 250 courses of study, 127 of which include the option to teach in schools.

UDE is considered a paradigm throughout Germany of how equity in education can be implemented at a university with a strong track record in research. Numerous measures and projects are in place to support talented young people and offer them prospects. UDE considers itself a vibrant environment of diversity and openness where students, researchers and staff can unfold their potential and willingness to perform. At the same time, we make every effort to ensure our development covers a wide range of areas and is resource-friendly.

In a strategic partnership, UDE is affiliated with Ruhr University Bochum (RUB) and TU Dortmund University. Together, they form the University Alliance Ruhr (UA Ruhr) and collaborate closely in research and teaching. They also have joint liaison offices on two continents. In addition, UDE maintains partnerships with more than 100 universities around the world.

What we offer as an employer:

Seal of quality from the German Association of University Professors and Lecturers

In August 2014, the University of Duisburg-Essen received the German Association of University Professors and Lecturers' (DHV) seal of quality for the fair and transparent nature of its appointment proceedings.

In August 2017, UDE also successfully underwent the re-audit procedure that takes place after three years and was awarded the seal of quality for the fair and transparent nature of its appointment proceedings for a further five years.

Family-friendliness

At UDE, there is a wide variety of services aimed at helping to reconcile work and family. The Family Service Office provides advice regarding very practical matters of childcare and care for relatives. Furthermore, there are various care services on offer including daycare facilities, holiday care and short-term care.

Since 2010, UDE has also successfully taken part in the family-friendly university audit (audit familiengerechte hochschule) run by berufundfamilie Service GmbH. Even as a 'family-friendly university', UDE continues to consider improving family-friendliness a shared goal of all University members and consistently pursues the self-commitments that result from the audit.

Onboarding and Dual Career Service

The Onboarding team within the Appointment Management Department provide advice for getting started at UDE and can connect you with UDE's consultation services. They also offer the Dual Career Service.

Coaching and further training

The personal further development of its staff members with management responsibilities is of particular importance to UDE. At UDE, it goes without saying that we offer coaching and seminars on leadership development, which are provided both internally and externally. Together with the Personnel Development Department, other suitable tools for furthering these staff members can be identified.

Promoting good health

As part of UDE's efforts to promote good health, there are numerous opportunities that enable staff to do something for their health and well-being in an active way at or near to the workplace.

Company ticket

The company transport ticket enables inexpensive and environmentally friendly mobility.

II. Faculty of Chemistry

The Faculty of Chemistry is located on the Essen campus where is has modern laboratories and offices. With a staff of 29 professors, 75 academic staff members (FTEs; plus approximately 90 FTEs that are financed through third-party funds) and 80 technical and administration staff members, it currently covers eight different branches: Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Technical Chemistry, Analytical Chemistry, Environmental Microbiology and Biotechnology (EMB), Didactics of Chemistry, and Theoretical Chemistry. Approximately 2,000 students, distributed evenly across the three study programmes/fields of Chemistry, Water Science and teacher training, and nearly 400 doctoral candidates are currently enrolled at the faculty, making it one of the largest faculties of chemistry in Germany. Every year, approximately 50 early career researchers, not only from the field of chemistry but also physics, biology and engineering, receive their PhD here. In this context, the faculty also cooperates closely with the neighbouring universities of applied sciences in Krefeld and Gelsenkirchen.

The building S07 at the Essen campus houses almost 100 modern chemistry laboratories.

The faculty represents the entire breadth of chemical research, from purely fundamental research to more application-oriented research as conducted in the faculty's two affiliated institutes, the German Textile Research Center North-West (DTNW) in Krefeld and IWW Water Centre in Mülheim, for example. There is also close cooperation in research at all levels with the Max Planck Institutes in the surrounding area, in Mülheim (coal research and chemical energy conversion) and Dortmund (physiological chemistry). In addition, researchers from these institutions take on teaching roles as honorary professors, *Privatdozent* senior lecturers and contracted teaching staff at our faculty.

The faculty contributes to three of the University of Duisburg-Essen's five strategic research areas, namely Water Research, Nanosciences and Biomedical Sciences. The new **ACTIVE SITES** research building, the construction of which was approved in 2022 by the German Science and Humanities Council, is to serve as an interface between these three strategic research areas,

where a focus is placed on the interdisciplinary development of methods for characterising active sites in aqueous functional environments (www.uni-due.de/activesites). A total of 21 working groups from the Faculties of Chemistry, Physics, Biology and Engineering contribute to the research agenda. With its method-centred research approach, ACTIVE SITES addresses the issue of characterising active sites *in ambience* and *operando*, including their preparation. Examining active sites in water under ambient conditions using new methods and combinations of methods within ACTIVE SITES is a cross-faculty focus area that will enhance the understanding of fundamental processes in aqueous environments and at solid-fluid interfaces from molecular to cellular level.

Water Research was established in 2020 as UDE's most recent strategic research area. On the part of the Faculty of Chemistry, its activities are primarily driven by the working groups in Analytical Chemistry and Technical Chemistry and the Environmental Microbiology and Biotechnology branch (EMB), who are also actively involved in the board of the Centre for Water and Environmental Research (ZWU) and, in addition, manage IWW Water Centre in Mülheim an der Ruhr. Its 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. The Faculty of Chemistry provided the spokesperson of the *Future Water* graduate school that was funded by the state of North Rhine-Westphalia and completed in 2022 after an eight-year funding period. In the field of water research, there is close cooperation with the Faculty of Biology, which, in addition to biomedical research, also focuses mainly on water research. The collaborative research centre 1439 *RESIST* was initiated in 2021 by the Faculty of Biology with strong participation from the field of chemistry. A funding recommendation has been issued for the construction of the new *FutureWaterCampus* research building to which the Faculty of Chemistry will make significant contributions.

The interdisciplinary strategic research area **Nanosciences** 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 functionalisation, nanomaterials research, soft materials, self-assembly and self-organisation, supramolecular chemistry and crystallography. Working groups of the Faculty of Chemistry are active members of the *Center for Nanointegration Duisburg-Essen* (CENIDE) and of the NanoEnergieTechnik-Zentrum (NETZ) in Duisburg. Chemistry working groups involved in suitable research projects have the opportunity to use the infrastructure of the NETZ building. In matters related to heterogeneous catalysis and energy research, the faculty seeks to closely cooperate with the Max Planck Institutes for Chemical Energy Conversion and for Coal Research in Mülheim and with partners at Ruhr University in Bochum. These regional competences are joined in the collaborative research centre Transregio 247 *Heterogeneous Oxidation Catalysis in the Liquid Phase*, which has been running since 2018. In this setting, new catalysts for water electrolysis that could help efficiently store electrical power produced from renewable resources are being investigated among other things in close cooperation between the various facilities and institutions. 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*. Moreover, a member of the Faculty of Chemistry leads the priority programme 2122 *Materials for Additive Manufacturing*.

Activities in the area of **Biomedical Sciences** include bio-organic and supramolecular chemistry, biomaterials research, drug development and release as well as biophysical chemistry. Working groups from the fields of organic, inorganic and physical chemistry, as well as biotechnology, are particularly active in this area and also work in the *Center for Medical Biotechnology* (ZMB). This research field is reflected in teaching in the specialisation option in Medical-Biological Chemistry as part of the master's course in Chemistry. Scientists from our faculty cooperate in a wide range of joint projects with colleagues from the fields of biology and medicine. The collaborative research centre 1093 *Supramolecular Chemistry on Proteins*, which was recently concluded after a successful eight-year funding period with a spokesperson from the Faculty of Chemistry, is particularly noteworthy.

Empirical educational research is another research focus area of the faculty, which is manifested in particular in the subject Didactics of Chemistry. Staff from this field are currently involved in a collaboration consisting of five DFG projects. Their collaborative efforts explore the reasons that lead to successful studies and to dropping out of university during the early stages of studying sciences and technology, as well as potential intervention methods. All professors in Didactics of Chemistry are members of the Interdisciplinary Centre for Educational Research (IZfB). The Centre for Teacher Training (ZLB) coordinates the graduate school for cross-disciplinary issues in teacher training and school and teaching development (GKqL), established in April 2019, with significant participation from the Faculty of Chemistry.

The faculty's research is heavily funded by third parties. The amount of third-party funding acquired has been steadily increasing in recent years and has now stabilised at a level that can be considered high, even when compared with other universities throughout NRW and Germany (currently almost €10 million across the faculty).

Many of the research activities outlined above are highly interdisciplinary, which is why almost all of the faculty's working groups cooperate intensively with scientists from other faculties of our university (especially biology, medicine, physics, engineering and educational sciences) and with other research groups in Germany and abroad, as illustrated by the examples given. Furthermore, the faculty is represented through its members in various national and international bodies.

With regard to promoting early career researchers, members of the faculty have had excellent success over the past years, such as funding as part of the North Rhine-Westphalian Returning Scholars Programme, Liebig Fellowships, admissions to the DFG Heisenberg Programme and BMBF junior research groups.

A strategic partnership is in place with Evonik Industries, in the context of which Evonik provides funds for projects and events held at the faculty. As well as an endowed junior professorship and the Werdelmann lecture series, the Werdelmann Foundation specifically finances doctoral projects at our faculty.

At present, the Faculty of Chemistry offers the following courses of study:

- Consecutive bachelor's/master's courses in Chemistry
- Consecutive bachelor's/master's courses in Water Science: Chemistry, Analytics, Microbiology

- Consecutive bachelor's/master's courses in Chemistry with the option to teach at a) mid-level secondary schools (HRSGe); b) secondary schools offering university entrance qualification (GyGe); and c) vocational colleges (BK)
- Consecutive bachelor's/master's courses in Biotechnology with the option to teach at vocational colleges
- Consecutive bachelor's/master's courses with the option to teach at primary schools in Learning Field III Natural and Social Sciences

With accredited bachelor's and master's courses, it is ensured that degrees (Bachelor of Science, B.Sc., and Master of Science, M.Sc.) are equivalent throughout Europe, also in the sense of Europe-wide recognition as a Eurobachelor. Following the transition to system accreditation, a first external institutional evaluation was conducted in 2017, attesting that the faculty achieves high quality in teaching and internationally acknowledged strength in research.

The faculty places a particular emphasis on high quality of teaching: students' feedback on lectures and seminars is regularly evaluated and taken into consideration when further developing the classes offered. During their first semesters, the aspiring scientists and teachers receive particularly comprehensive support from groups of tutors and mentors. Practical training in the fundamental stages of studies is carried out in newly equipped, modern practical training halls, while it is usual for more advanced students to be closely affiliated with the research of the working groups. Even during their bachelor's studies, students typically encounter topical research issues as early as in their fifth semester – in the master's programme, early integration in research is all the more natural.

In the field of recruiting young talent, the Faculty of Chemistry offers a number of events for pupils. Outstanding upper-level secondary school pupils can already attend the basic lectures during their school years and obtain credits for their later studies. The faculty continues to participate successfully in the SommerUni events aimed specifically at women and offers a highly sought-after trial study of chemistry. The experimental practice experience for pupils (SEPP), established by the Faculty of Chemistry and available to lower secondary school classes once a week, is already booked out for months in advance. Moreover, approximately 20 pupils per year are admitted to the faculty for individual work placements (usually between one and three weeks) within the different working groups.

III. The research agenda of ACTIVE SITES – an overview

ACTIVE SITES (www.uni-due.de/activesites) connects research-intensive subject fields within the areas of natural sciences and engineering at UDE with the aim of exploring chemical, biological and physical processes in active sites in their aqueous functional environment. The spokesperson for the ACTIVE SITES project is affiliated with the Faculty of Chemistry and all of the faculty's branches, with the exception of didactics, are incorporated into the project's research agenda, which has a focus on the interdisciplinary development of methods. Active sites are atomic adsorption and reaction sites for molecules, for example in catalysis, or non-covalent binding sites for supramolecular, protein-specific ligands. The property profiles of individual cells in cell communities can also be considered active sites of ecosystems. At single cell level, the aim is to decode their genome, transcriptome, metabolome and proteome. The preparation and distribution of samples and the instrumental analytical methodology for the characterisation of active sites are developed in the aqueous functional environment (in ambience), while the in-situ characterisation of active sites is also developed in operating conditions (operando). There is a particular focus on combining methods to characterise the active sites together with their function-determining liquid environment. ACTIVE SITES' method-oriented research agenda acts as a liaison in terms of content, connecting areas within UDE as well as three of the four UA Ruhr research centres on a regional level. It is expected that future professorships with similar focuses introduce new research questions and methodological expertise, thereby strengthening the impact of the ACTIVE SITES research agenda. With the research building, an integrative approach is pursued and topic-oriented, shared use research spaces and infrastructure are offered to enable fundamental interdisciplinary research.

Visualisation of the planned ACTIVE SITES research building at the campus Essen

IV. The Technical Chemistry branch

The Technical Chemistry at UDE has a highly collaborative and cooperative research profile. It has collaborations within the Faculty of Chemistry as well as with neighbouring faculties in the strategic research areas of Nanosciences, Water Research and Biomedical Sciences. The spokesperson (Prof. habil. Dr.-Ing Barcikowski) and deputy spokesperson (Jun.-Prof. Dr. Andronescu) of ACTIVE SITES (see Section IV) are affiliated with the Technical Chemistry branch. Technical Chemistry is involved in a series of DFG-funded cooperative programmes, including two collaborative research centres/Transregios, a priority programme and a research unit, as well as a MERCUR research unit. There are also numerous cooperations in the area of collaborative research with external partners, for example in the fields of catalysis, biomedicine, and additive manufacturing.

The Technical Chemistry branch is composed of the following existing and planned professorships:

- Technical Chemistry I, W3 professorship, held by Prof. habil. Dr.-Ing. Stephan Barcikowski
- Technical Chemistry II, W3 professorship in Technical and Macromolecular Chemistry for Water Research as described here (TMCW; to succeed Prof. Dr. Mathias Ulbricht)
- Technical Chemistry III, W1 to W2 tenure track professorship, held by Jun.-Prof. Dr. Corina Andronescu
- Technical Chemistry IV, planned W3 professorship from 2027 in Scale-Up Chemistry – Reaction Engineering under Dynamic Operating Conditions (RXDY; additional professorship)

The working group led by Prof. habil. Dr.-Ing. Barcikowski focuses on the laser synthesis and processing of colloidal nanoparticles for applications in catalysis, biomedicine and additive manufacturing. The nanomaterials generated are subjected to functional analysis both in house and within collaborations. The research interests of the working group led by Jun.-Prof. Dr. Andronescu cover fundamental and applied topics that focus on understanding electrocatalysts and electrode design for CO_2 electroreduction and electrocatalytic alcohol oxidation, as well as paired electrolysis, high-throughput materials discovery and single-entity electrochemistry. The professorship advertised here is to bridge the gap between the ACTIVE SITES research agenda (see Section IV) and water research by developing materials for aqueous separation processes and optimising them for application. It would be an ideal addition to this branch if the successful candidate for the advertised professorship used polymer-based materials (membranes, filters, emulsions, micelles, etc.) for separation processes in water and developed them further in a scalable manner. Applications in the fields of heterogeneous catalysis (for example aqueous membrane electrolysis) and/or water treatment (separating biological or organic substances from water) would also supplement the profile of the Technical Chemistry branch perfectly.

V. Requirements of the professorship 'Technical Chemistry – Technical and Macromolecular Chemistry for Water Research'

a. Information about the position

We are looking for an internationally prominent researcher who conducts research in a topical area of technical chemistry and would make a valuable addition to the current research profile in chemistry at the University of Duisburg-Essen. Knowledge is required in the field of technical and macromolecular chemistry for scalable, material-based aqueous separation processes. Candidates are expected to propose an innovative research plan that strengthens the research agenda of ACTIVE SITES (www.uni-due.de/activesites) and presents a clear perspective for collaboration with existing research groups within the Faculty of Chemistry, the Center for Nanointegration Duisburg-Essen (CENIDE) and the Centre for Water and Environmental Research (ZWU). As well as subject-specific competence, transferable skills such as conversation skills, internationality, leadership skills, and teaching experience are expected.

The successful candidate is to teach across the whole field of technical chemistry and give the relevant classes in the degree programmes for Chemistry (BSc, MSc), Water Science (BSc, MSc) and teacher training (BSc, MSc).

We expect the successful candidate to have published papers in leading refereed publication media and to have the ability to acquire and conduct projects with external funding from competitive schemes, preferably projects funded by the German Research Foundation (DFG), as appropriate to the advertised position. Involvement in international research and interdisciplinary cooperations is expected. It is required that the successful candidate actively participates in academic self-governance and has the ability to lead a team in research environments.

The University of Duisburg-Essen places particular emphasis on teaching quality. Therefore, candidates must outline their didactic concepts, also taking the profile of the University of Duisburg-Essen into consideration.

The hiring requirements are based on Section 36 of the North Rhine-Westphalian Higher Education Act *(Hochschulgesetz NRW*; HG NRW).

b. Supplementary information on the open position

The laboratory facilities for this professorship include spaces in the experimental hall on the ground floor, in the laboratories on the first floor of building S05 and on the first floor in building S07 and provide cutting-edge infrastructure for technical-chemical, separation technological and macromolecular research. In the case of compatibility with the ACTIVE SITES research agenda (see above), there is the additional option to use spaces in the corresponding new research building from 2027. Furthermore, shared use of the experimental facilities in the planned FutureWaterCampus research building is also envisaged.

The professorship is assigned the regular teaching load of nine units per week each semester. Own initiatives for new didactic concepts or innovative forms of teaching, including e-learning opportunities in lectures, seminars and practical courses are encouraged.

Details of the means to be provided to the professorship in future (staff, rooms, regular funding and infrastructure) will be presented or shown to the invited candidates during a tour of the premises of the Technical Chemistry branch.

The Faculty of Chemistry is equipped with several central analytical service units (including nuclear magnetic resonance spectroscopy (NMR), mass spectrometry (MS), scanning electron microscopy, elemental analysis, single-crystal and powder X-ray diffraction, and polymer characterisation), which are available for shared use in addition to UDE facilities (such as the ICAN centre for nanoanalytics and the IMCES imaging centre).

VI. Legal framework

Universities are state-funded bodies under public law with legal capacity. State funding is based on the university's tasks, the obligations agreed upon in university contracts and the university's performance. They have a global budget and are not subject to individual instructions from the Ministry for Culture and Science of the state of North Rhine-Westphalia.

If the legal requirements are met, professors are appointed as permanent civil servants as a rule. Professors can also be appointed on the basis of an employment contract under private law.

When awarding a junior professorship, it is to be noted that individuals who already meet the hiring requirements for a university professorship due to having completed a habilitation or another reason cannot be considered.

Further information (in German):

- Contacts
  www.uni-due.de/verwaltung/organisation/peo_professoren.php
- Regulations on the appointment proceedings
  www.uni-due.de/imperia/md/content/zentralverwaltung/bereinigte_sammlung/2-10-mai12.pdf
- Information on the appointment and hiring process
  www.uni-due.de/verwaltung/berufungsmanagement/

VII. Salary

The salary of university teaching staff is stipulated by the North Rhine-Westphalian system for the remuneration of civil servants. These staff members fall under the W salary range, which contains the bands W1, W2, and W3.

Basic salaries can be supplemented with (performance) bonuses in bands W2 and W3. These performance-based salary components can be awarded

- as a result of appointment and retention negotiations (appointment and retention bonuses),

- for special achievements in research, teaching, art, further education and supporting early career researchers (special achievement bonuses),
- for assuming functional or special responsibilities as part of the University's self-governance or University management (functional bonuses).

In certain circumstances, so-called teaching and research bonuses may be paid from private third-party funds.

During appointment and retention negotiations, performance bonuses can also be agreed for a fixed period of time if they are linked to target and performance agreements.

Appointment bonuses are to be negotiated on an individual basis with the Rector of the University of Duisburg-Essen as part of appointment negotiations.

Please find a table showing the current remuneration (in North Rhine-Westphalia) for the salary bands W1, W2, and W3 at:

- www.lbv.nrw.de/beztab/beso.php

You can find information on the W salary range (in North Rhine-Westphalia) and the legal foundations for it on the following webpages:

- www.uni-due.de/verwaltung/organisation/peo_links.php
- https://www.hochschulverband.de/leistungen/infocenter

Further information (in German) can be found in the regulations on awarding performance-related bonuses:

- www.uni-due.de/imperia/md/content/zentralverwaltung/bereinigte_sammlung/3_60.pdf