



Deutscher Akademischer Austauschdienst  
German Academic Exchange Service



## Table of Contents

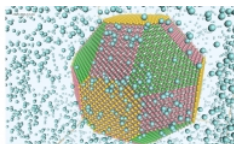
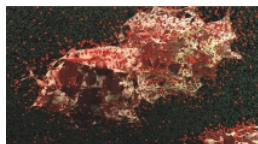
<b>Doctorate .....</b>	<b>2</b>
<b>IMPRS for Sustainable Metallurgy • Max-Planck-Institut für Eisenforschung • Düsseldorf .....</b>	<b>2</b>

# Doctorate



## IMPRS for Sustainable Metallurgy

Max-Planck-Institut für Eisenforschung • Düsseldorf



## Overview

Degree	PhD (Dr-Ing or Dr rer nat)
Doctoral degree or degree awarded by	Ruhr-Universität Bochum or Universität Duisburg-Essen
In cooperation with	Max-Planck-Institut für Kohlenforschung, Mülheim/Ruhr Ruhr-Universität Bochum Universität Duisburg-Essen
Teaching language	<ul style="list-style-type: none"><li>English</li></ul>
Languages	The doctoral programme is conducted entirely in English.
Full-time / part-time	<ul style="list-style-type: none"><li>full-time</li></ul>
Programme duration	6 semesters
Beginning	Other
Additional information on beginning, duration and mode of study	Beginning is in January each year or individually later.
Application deadline	There is one application round in September/October each year.
Tuition fees per semester in EUR	None
Combined Master's degree / PhD programme	No
Joint degree / double degree programme	No

#### Description/content

Our structured, three-year doctoral programme, conducted entirely in English, takes an intensive interdisciplinary approach and brings together scientists from across the globe in the Rhine-Ruhr metropolitan region of Germany.

Metallurgy has provided humankind with materials, tools and the associated progress for more than five millennia. It is not only a huge engineering success story but has also become the biggest single industrial environmental burden of our generation. Disruptive innovations are required for alternative reduction processes that convert mineral ores into metals without today's carbon-based methods that release huge amounts of CO<sub>2</sub>. SusMet focuses on the exploration of carbon-free sustainable metallurgy, employing hydrogen as reducing agent, direct electroreduction (electrolysis), and plasma synthesis.

Correlated experimental, ab initio and multi-scale techniques are central to our mission:

- Development and application of advanced simulation techniques to explore and identify the fundamental structures and mechanisms occurring in these materials and their synthesis over all relevant length scales (e.g., cutting-edge ab initio methods, atomistic simulation methods, multi-scale modelling, machine learning)
- High resolution analysis, monitoring of chemistry, structure and transformations at the atomic scale of buried interfaces and defects by correlated experimental techniques in both space and time (e.g., correlated APT, TEM, FIM, EBIC, EBSD, XPS Kelvin probe microscopy, machine learning augmented analysis techniques)

## Course Details

#### Course organisation

The curriculum of the IMPRS SusMet contains several scientific and non-scientific elements and a close supervision. The elements of the curriculum bring the community of the SusMet students together. They deepen and extend the scientific knowledge but they also enhance social competences and support the integration of the doctoral students in the scientific community and in Germany.

The **SusMet Lectures** give insight into the various aspects of modern materials science. There are two basic lectures:

- Basic materials-related aspects of sustainability
- Large-scale metallurgical processes

Additionally, there are six advanced lectures, from which the doctoral students select two:

- Materials science topics of a hydrogen-based economy
- Sustainable primary synthesis of aluminium and iron: electrolysis, plasma, and direct reduction
- The role of multi-scale modelling in metallurgical processes and materials sustainability
- Characterisation techniques for materials: from atomistics to the meso-scale
- Elementary mechanics and damage processes
- Component life extension: corrosion, stress-corrosion, abrasion, tribology, and fatigue

Furthermore, there are Welcome Days, the annual retreat, and workshops on specific SusMet-related topics as well as lab exchanges.

Additional non-scientific offerings include soft skill trainings, German language courses, and career development.

[» PDF Download](#)

#### A Diploma supplement will be issued

Yes

#### Special promotion / funding of the programme

- IMPRS

Course-specific, integrated German language courses	No
Course-specific, integrated English language courses	No

## Costs / Funding

Tuition fees per semester in EUR	None
Semester contribution	Approx. 330 EUR per semester
Funding opportunities within the university	Yes
Description of the above-mentioned funding opportunities within the university	<p>Funding is offered for three years:</p> <ul style="list-style-type: none"> <li>• at the Max Planck Institutes: TVöD Bund EG 13 65%, about 35,000 EUR gross per year</li> <li>• at the Universität Duisburg-Essen: TV-L EG 13 65%, about 35,000 EUR gross per year</li> <li>• at the Ruhr-Universität Bochum: scholarship of 1,800 EUR per month</li> </ul>

## Requirements / Registration

Academic admission requirements	<p>Excellent Master's degree in materials science, physics, engineering or chemistry</p> <p>We particularly encourage applications from candidates with a computational background.</p>
Language requirements	The applicants must provide a proof of their English proficiency (TOEFL, IELTS, or the equivalent).
Application deadline	There is one application round in September/October each year.
Submit application to	Please apply online: <a href="https://www.mpie.de/2941513/admission">https://www.mpie.de/2941513/admission</a>

## Services

Structured research and supervision	Yes
Research training / discussion	Yes
Career advisory service	There is a career development offering.

#### Support for international students and doctoral candidates

- Welcome event
- Visa matters
- Help with finding accommodation
- Support with registration procedures

#### General services and support for international students and doctoral candidates

The programme coordination and the international offices at the partner institutes give all necessary support in bureaucratic matters and daily life in Germany. You will be supported with visa issues, finding appropriate accommodation, opening a bank account and so on.

There is also close supervision of all PhD projects with at least two supervisors from different departments or partner institutes and regular status meetings with the Thesis Advisory Committee (TAC).

Furthermore, there are Welcome Days, soft skill trainings and German language courses.

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## Our Partners



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# Max-Planck-Institut für Eisenforschung

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Max Planck Institutes are known worldwide and offer state-of-the-art research facilities. The Max-Planck-Institut für Eisenforschung (MPIE) was founded in 1917. Its international team conducts advanced basic materials research related to the fields of mobility, energy, infrastructure, medicine and digitalisation. It focuses on nanostructured metallic materials as well as semiconductors and analyses them down to their atomic and electronic scales. This enables the scientists to develop new, tailor-made structural and functional materials embracing their synthesis, processing, characterisation, and properties as well as their response in engineering components exposed to real operating environments.



## Location

The Max-Planck-Institut für Eisenforschung and all of our partner institutes are located in the vibrant, culturally rich and diverse Rhine-Ruhr metropolitan region of Germany, which is near the Netherlands, the Eifel – a volcanic low mountain range – and other pleasant regions.

## Contact

### Max-Planck-Institut für Eisenforschung

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🌐 Course website: <https://www.mpie.de/2747306/doctoral-program>

🌐 <https://www.linkedin.com/school/mpie-doctoralprogramme/>

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# International Programmes in Germany - Database

[www.daad.de/international-programmes](http://www.daad.de/international-programmes)  
[www.daad.de/sommerkurse](http://www.daad.de/sommerkurse)

## Editor

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## GATE-Germany

Consortium for International Higher Education Marketing  
[www.gate-germany.de](http://www.gate-germany.de)

## Disclaimer

The data used for this database was collected and analysed in good faith and with due diligence. The DAAD and the Content5 AG accept no liability for the correctness of the data contained in the "International Programmes in Germany" and "Language and Short Courses in Germany".

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Federal Ministry  
of Education  
and Research