Materials Science

Degree conferred
Scientiarum doctor in scientia materiarum / Doctor of Philosophy in Materials Science (PhD)

Commencement of studies
An application for admission may be submitted at any time.

Regulation
https://studies.unifr.ch/go/1Q *(French and German only)*

Application procedure
Candidates with Swiss qualifications
https://studies.unifr.ch/go/Ui3b4
Candidates with foreign qualifications
https://studies.unifr.ch/go/2KPbe

Fribourg profile

The Adolphe Merkle Institute (AMI) employs around 50 PhD students in the four main AMI research groups and one junior group. The working language at the AMI is English, and the PhD thesis comprises a three to four-year personal research project within one of the groups. The mentoring staff at AMI is devoted to instilling in doctoral candidates the desire to perpetuate a tradition of high scientific quality. The state-of-the-art facilities provide students with the potential to acquire a wide range of valuable knowledge and skills over the course of their studies. The quality of the research equipment constitutes one of the significant assets of the programme, as the trainees can master various experimental techniques. The combination of interdisciplinarity, outstanding infrastructure, and educational commitment makes the AMI one of the best places to study soft nanomaterials at the postgraduate level.

The institute strives to be a leader in this area and hosts both fundamental and application-oriented interdisciplinary research programmes. Our researchers are currently organised into four main research groups and one junior group, which offer complementary expertise and interests in strategically important areas:

BioNanomaterials
The BioNanomaterials research group is co-led by **Prof. Alke Fink** and **Prof. Barbara Rothen-Rutishauser**. Prof. Fink leads the materials science aspect of the group, and Prof. Rothen-Rutishauser is responsible for all biological studies. This provides an exciting perspective on scientific research in an academic setting, unifying two different scientific backgrounds to form a strong interdisciplinary research group. The multidisciplinary nature of the BioNanomaterials research group is further expressed by the varied scientific backgrounds of its members, which include chemistry and biochemistry, biology, pharmacy, biomedicine, materials science, and biophysics.

For more information: https://www.ami.swiss/bionanomaterials/en/

Biophysics
The overarching research goal in the Biophysics laboratory, led by **Prof. Michael Mayer**, is to apply biophysics knowledge toward improving human health. To this end, his group contributes to the molecular understanding of disease by developing sensitive diagnostic assays and sensors and characterising individual protein molecules for applications in biomarker detection, routine protein analysis, and proteomics. Research is multidisciplinary and collaborative, and many projects take their inspiration from nature to develop biophysical assays, methods, and tools that enable molecular-scale interrogations with unprecedented information content, sensitivity, and speed.

For more information: https://www.ami.swiss/biophysics/en/

Polymer Chemistry and Materials
Motivated by the desire to create novel (nano)materials that exhibit currently unavailable properties and enable new applications, the primary research focus of the Polymer Chemistry and Materials group led by **Prof. Christoph Weder** is the design, synthesis, and investigation of structure-property relationships of novel functional polymers. Nature's materials inspire many projects and utilise bio-based building blocks, such as cellulose nanocrystals. Interests and activities are interdisciplinary and range from synthesising new monomers and polymers to advanced polymer processing and the in-depth investigation and technological exploitation of materials with unusual but desirable properties.

For more information: https://www.ami.swiss/en/groups/polymer-chemistry-and-materials/

Soft Matter Physics
How does assembling materials on the 10 nm to 1 m length scale determine its function? This question motivates most of the soft-matter physics group projects. Currently, the two main topics encompass energy and optical materials. In the energy materials field, we investigate structure-function interplay in organic and perovskite-based solar cells and lithium-ion batteries. Optical materials include plasmonic metals that are structured with the help of polymer self-assembly and bioinspired photonic bandgap materials. The latter is part of the group's strong focus on bioinspiration that also includes surface properties of (nano-) structured materials such as wetting, adhesion, and mechanical properties (e.g., nacre).

For more information: https://www.ami.swiss/physics/en/

Mechanoresponsive Materials
The Mechanoresponsive Materials group is led by **Prof. Jessica Clough**. The group is focused on developing optical probes for polymers and soft matter, particularly for the detection of mechanical damage in these materials. These probes provide a warning when a material is about to fail and allow us to understand why it fails. The researchers aim to design molecular probes that are suitable for advanced imaging techniques, which allow the local properties of soft materials to be mapped with greater spatial

resolution, sensitivity, and dynamic range than ever before.

For more information: https://www.ami.swiss/mechanoresponsive/en/

Interdisciplinary collaborations between our researchers are the basis for the successful and efficient execution of complex research projects that transcend the boundaries of traditional scientific disciplines.

Open PhD positions will be advertised on the AMI webpage. Unsolicited applications not targeting an advertised position will not necessarily receive a response.

Studies organisation

Structure of studies

No ECTS credits can be earned.

Doctoral school

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Admission

In order to be admitted to a doctorate the candidate must have been awarded an academic **bachelor's and master's degree** or an equivalent qualification from a university recognised by the University of Fribourg.

Before applying for a doctorate the candidate must contact **a professor** who would be willing to supervise the thesis work.

There is **no general right** to be admitted to a doctorate.

The respective conditions of admission for each doctoral study programme are reserved.

Contact

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Switzerland
http://ami.swiss

Doc- Postdoc-portal

http://www.unifr.ch/phd