

# Materials Chemistry and Mineralogy

International Master's Program at the University of Bremen

**Solid State Synthesis & Characterization**  
**Surface Reactions**  
**Technical Chemistry**

**Crystal Structure**  
**Ceramics**  
**Minerals and Materials**

## In brief

Degree: Master of Science (M.Sc.) Materials Chemistry and Mineralogy

Duration: 2 years

Admission requirement:

B.Sc. in chemistry, materials science or mineralogy

English proficiency C1

Teaching language: English with just two elective modules in German

Application deadline: April 30

Program start: October

## Program

Materials Chemistry and Mineralogy is an international postgraduate study program covering application and research related topics ranging from raw materials to industrial products.

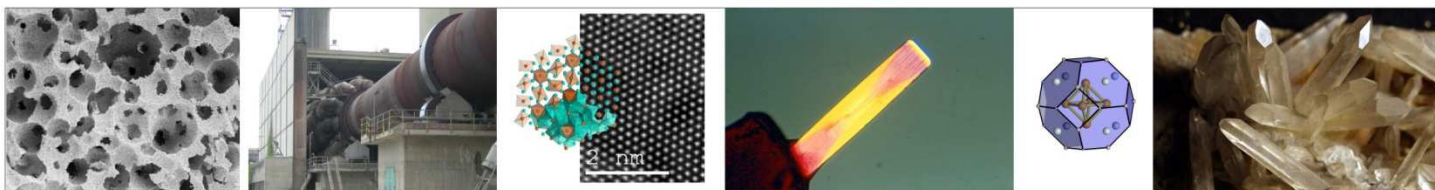
The curriculum is divided into a general mandatory part and an elective part focusing on either chemistry or mineralogy. The mandatory part (42 CP) includes lectures and exercises in the fields of mineralogy, crystallography, chemistry (solid state and surfaces) and materials science, and a broad education in analytical methods. In the elective part (48 CP) special topics and skills in the field of materials chemistry or mineralogy are covered.

The interdisciplinary study program is offered in cooperation of the Depts. of Geosciences and Chemistry with strong contributions from the Engineering and Physics Depts. and the University of Applied Sciences.



## Prospects

- Materials-oriented industries such as glass, ceramics, refractories, paper, dye, pharmaceuticals, gemstones and building materials
- Materials-dependent fields such as biomineralization, dentistry, electronics, energy supply and storage, and crystal growth
- Recycling, waste management and remediation industries
- Materials research at universities and other research institutes
- Knowledge-based work in quality management, patent systems, environmental authorities, education and consulting



## Materials Chemistry and Mineralogy at Bremen University

Located in one of the largest geoscience departments in Germany hosting the renowned MARUM marine research center, the master's program is organized by both Chemistry and Geosciences departments, thus profiting from their combined strengths. Strong support from the depts. of Engineering and Physics and the University of Applied Sciences makes it truly interdisciplinary and unique.

Geosciences and Materials Sciences are two out of six high-profile areas at the University of Bremen, a mid-sized university (~18,000 students) renowned for excellent research and teaching.

Students in Materials Chemistry and Mineralogy profit from the up-to-date scientific instrumentation. Special emphases lie on materials, e.g., ceramics, oxidic nanoparticles, building materials, inorganic surfaces, porous materials, and methods for materials' analysis, including diffraction, spectroscopy, scanning and transmission electron microscopy, etc.





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## Program structure

Analytical Methods I	Mineralogy	Crystallography	Chemistry	Materials Science	1 <sup>st</sup> Year
Analytical Methods II	Profile block: 3-5 modules from chemistry and 1-3 modules from mineralogy or vice versa				
General Studies	Profile block (cont.)		Research Module Chemistry/Mineralogy		2 <sup>nd</sup> Year
Master Thesis					

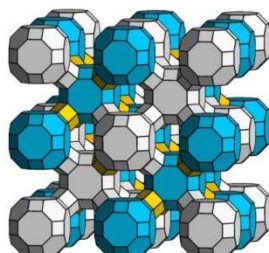
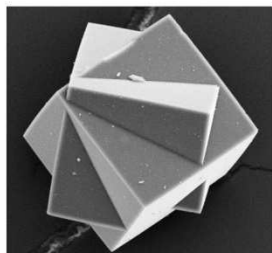
During the first semester fundamentals of all core subjects are presented in lectures and accompanying exercises, including mineralogy, crystallography, chemistry and materials science.

Furthermore, a two-semester training in a number of analytical methods starts and is continued in the second semester. Here, the two-semester profile section starts which comprises 48 CP. Within a profile 30-42 CP are to be accumulated while 6-18 CP are to be selected from the second profile (for details see syllabus). The General Studies module is dedicated to an elective course from the university's program and a programming course.

Once the profile has been fixed, this is also a commitment for the choice of the research module. It is dedicated to the development and presentation of research projects and prepares the students for their master thesis. The fourth semester is reserved for thesis work, which has to be defended in a colloquium.

Teaching units are predominantly scheduled as weekly assignments throughout an academic semester (Oct.-Feb., Apr-Jul).

Short field excursions (depending on the selected elective modules), lab work, or special projects may be scheduled as blocks assigned to a few weeks within a semester break.



## Syllabus elective subjects (modules, courses)

### PROFILE CHEMISTRY

#### Solid State Synthesis and Characterization

Solid State Synthesis and Characterization  
Solid State Reactions

#### Structure Property Relationship

Structure Property Relations  
Structure Property Relations Seminar

#### Catalysis and Surface Chemistry

Heterogeneous Catalysis  
Vacuum and Cryotechnics  
Industry Excursion

#### Functional Surfaces

Molecular Layers  
Electron Induced Chemical Reactions  
Surface Modifications

#### Introduction to Technical Chemistry

Technical reaction processes

#### Research Module Chemistry I

Research Module Chemistry I

### PROFILE MINERALOGY

#### Crystal Structure Analysis

Crystal Structure Analysis and Crystal Chemistry  
Single Crystal Diffraction

#### Physical Properties of Crystals

Introduction to Crystal Physics  
Crystal Optics

#### Functional Ceramics (Teaching language German)

Bioceramics  
Modification and Characterisation of Material Surfaces for Biotechnological Applications

#### Minerals and Materials

Mineral Surfaces and Reactions  
Thermodynamics in Mineral Science

#### Petrology and Isotope Geochemistry

Mineral Deposits and Isotope Geochemistry  
Phase Equilibria - Principles, Applications and Computations

#### Technical Ceramics (Teaching language German)

Ceramics Lab Course  
Ceramic Nanotechnology

#### Special Topics in Material Science

Nanoparticles and Nanotechnology  
Zeolites, Catalysts and Ion Exchange

#### Building Materials

Building Materials Analysis and Characterizations  
Binders and Ceramic Building Materials  
Corrosion of Materials

## Application

For application the University of Bremen online application portal is open from March until April 30th each year:

<https://movein-uni-bremen.moveonnet.eu/movein/portal/studyportal.php>

Earlier enquiries should be sent to the contact email address (see information). Eligibility of applicants is evaluated based on their previous training (including grade point average, field of study, experience, etc.) and their specific study motivation.

## Requirements

- Explicit interest in natural sciences and materials, their use, characterization and development
- B.Sc. in chemistry, materials science, or in a geoscientific field with a specialization in crystallography or mineralogy
- Very good command of the English language (English proficiency test, level C1 for non-native speakers)
- Ability to work both independently and as part of a team
- Intercultural competence

## Information

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