

# Module Description 21-M60 Inorganic Chemistry - Specialisation: Focus Sustainability

Faculty of Chemistry

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This module guide reflects the current state and is subject to change. Up-to-date information and the latest version of this document can be found online via the page

<https://ekvv.uni-bielefeld.de/sinfo/publ/modul/694328188>

The current and valid provisions in the module guide are binding and further specify the subject-related regulations (German "FsB") published in the Official Announcements of Bielefeld University.

Non-official translation of the module descriptions. Only the German version is legally binding.

## **21-M60 Inorganic Chemistry - Specialisation: Focus Sustainability**

### **Faculty**

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Faculty of Chemistry

### **Person responsible for module**

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Prof. Dr. Thorsten Glaser

Prof. Dr. Berthold Hoge

Prof. Dr. Norbert W. Mitzel

### **Regular cycle (beginning)**

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Every winter semester

### **Credit points**

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10 Credit points

### **Competencies**

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This module provides in-depth knowledge of the molecular and electronic structure of coordination compounds as a basis for understanding the properties and reactivities of this class of substances. Students will be able to apply these principles to metal ions in living nature and thus gain access to the molecular basis of many essential reactions in nature.

Students practice the synthesis and application of homogeneous transition metal catalysts from the field of sustainable chemistry. Students master more specialized preparation techniques such as working under inert conditions and the advanced evaluation of analytical-spectroscopic data (FTIR, NMR, UV-Vis-NIR etc.). Students acquire the ability to work safely in the laboratory and to document their experimental work scientifically. The module enables students to independently plan syntheses of organic ligands and homogeneous transition metal catalysts and to apply analytical methods for the characterization of other molecules.

### **Content of teaching**

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The lecture deals with coordination and bioinorganic chemistry. This includes in detail:

- Coordination chemistry: structure and stability of transition metal complexes, magnetochemistry, binding ratios and reactivity of transition metal complexes.
- Bioinorganic chemistry: essential metal ions, metal binding sites in biomolecules, functions of metal ions in living nature, Cu proteins, Fe proteins, biometal organics, metals in medicine.

In the seminar, current research directions in inorganic molecular chemistry are presented in individual examples and case studies.

The practical course teaches more sophisticated inorganic chemical synthesis chemistry from the fields of complex and bioinorganic chemistry. The students will synthesize a homogeneous transition metal catalyst for the activation of small molecules and investigate its activity. For this purpose, the students will synthesize an organic ligand in a few

steps and use it for complex synthesis. In addition to the synthesis of the organic molecules and the transition metal catalyst, the students will characterize the compounds using various methods such as FTIR spectroscopy, NMR spectroscopy, UV-Vis-NIR spectroscopy, electrochemistry and single crystal X-ray structure analysis.

## Recommended previous knowledge

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For the lecture and the seminar:  
Advanced Modules in inorganic, organic and physical chemistry

## Necessary requirements

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For the practical course:  
21-M13,  
21-M20,  
21-M21.

## Explanation regarding the elements of the module

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In order to do justice to both the theoretical and practical parts of the module, an oral examination is required to evaluate the theoretical knowledge of the entire module, as well as a portfolio of various experiments to ensure the successful teaching of practical laboratory skills.

Module structure: 1 bPr, 1 uPr<sup>1</sup>

## Courses

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Title	Type	Regular cycle	Workload <sup>5</sup>	LP <sup>2</sup>
Inorganic Chemistry - Specialisation: Focus Sustainability	seminar	WiSe	30 h (15 + 15)	1
Inorganic Chemistry - Specialisation: Focus Sustainability	internship / laboratory internship	SoSe	150 h (105 + 45)	5 [Pr]
Coordination and Bioinorganic Chemistry	lecture	WiSe	120 h (45 + 75)	4 [Pr]

## Examinations

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Allocated examiner	Type	Weighting	Workload	LP <sup>2</sup>

<p>Teaching staff of the course <b>Inorganic Chemistry - Specialisation: Focus Sustainability (internship / laboratory internship)</b></p> <p><i>The portfolio of scientific experiments comprises 2 experiments, the elements of which are examined during the course. The examination components of an experiment are basically the following four elements, which are completed one after the other:</i></p> <ol style="list-style-type: none"> <li>1. review of prior knowledge including safety-relevant aspects</li> <li>2. carrying out the experiment and recording the execution, observations and results</li> <li>3. preparation of a written experiment protocol or an oral presentation of the results</li> <li>4. discussion of the experimental protocol, the results and the theory of the experiment (final examination)</li> </ol> <p><i>Subsequent elements of the experiment can only be started if the previous elements have been passed. In the case of individual experiments, individual elements may be omitted or, in relation to point 2, replaced by theorised elements after appropriate notification, provided that the learning objectives associated with the experiment are thereby achieved. An attempt is passed if all four elements have been completed and fulfil the requirements despite existing deficiencies.</i></p> <p><i>If an element of an attempt is not passed, there are two options:</i></p> <ol style="list-style-type: none"> <li>a) The entire attempt can be repeated or</li> <li>b) individual elements can be repeated if elements have already been assessed as "passed" and individual learning objectives of the attempt have therefore been achieved.</li> </ol> <p><i>This is decided by the person authorised to conduct the examination.</i></p> <p><i>The attempt or individual elements of an attempt can be repeated a maximum of once in this way. A total of one attempt per practical course and portfolio can be repeated in the aforementioned sense.</i></p>	Portfolio	without grades	-	-
<p>Teaching staff of the course <b>Coordination and Bioinorganic Chemistry (lecture)</b></p> <p><i>40 - 45 minutes.</i></p> <p><i>The content of teaching and competences of the entire module are examined.</i></p>	mündliche Prüfung	1	-	-

## Legend

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- 1 The module structure displays the required number of study requirements and examinations.
  - 2 LP is the short form for credit points.
  - 3 The figures in this column are the specialist semesters in which it is recommended to start the module. Depending on the individual study schedule, entirely different courses of study are possible and advisable.
  - 4 Explanations on mandatory option: "Obligation" means: This module is mandatory for the course of the studies; "Optional obligation" means: This module belongs to a number of modules available for selection under certain circumstances. This is more precisely regulated by the "Subject-related regulations" (see navigation).
  - 5 Workload (contact time + self-study)
- SoSe** Summer semester
- WiSe** Winter semester
- SL** study requirement
- Pr** Examination
- bPr** Number of examinations with grades
- uPr** Number of examinations without grades