## Course Specifications

Valid as from the academic year 2015-2016

### Superconducting Materials (C002966)

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**Course size**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>75 h</td>
<td>15.0 h</td>
</tr>
</tbody>
</table>

**Course offerings and teaching methods in academic year 2017-2018**

- **A (semester 1)**
  - lecture: 12.5 h
  - demonstration: 2.5 h

**Lecturers in academic year 2017-2018**

- Van Driessche, Isabel

**Offered in the following programmes in 2017-2018**

<table>
<thead>
<tr>
<th>Programme</th>
<th>credits</th>
<th>offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Science in Chemistry</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Chemical Engineering</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Sustainable Materials Engineering</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Materials Engineering</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Master of Science in Chemical Engineering</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Exchange Programme in Chemistry (master's level)</td>
<td>3</td>
<td>A</td>
</tr>
</tbody>
</table>

**Teaching languages**

- English

**Keywords**

- Superconductors, Advanced ceramics, solid state chemistry, synthesis, crystal structures, electro-magnetic properties

**Position of the course**

- Position of the course in the curriculum: research-related optional course in the second master in chemistry.
- Directly related to: Solid-state chemistry, first year master in chemistry
- Purpose of the course: Give the student advanced knowledge of superconducting materials, their crystallographic structures, synthesis and properties. The relationship to other scientific fields is shown and known principles are applied in new fields. The knowledge and scientific methods are also related to the scientific research and technological developments in this field. The course is an example of a multi-disciplinary approach, necessary for fundamental scientific research in this field.
- References of learning outcomes: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.6, 2.7, 2.8, 3.1, 3.2, 3.3, 3.5, 3.6, 4.1, 4.2, 4.3,

**Contents**

- Types of superconducting materials, history
- Processing of superconducting materials
- The structure of superconducting materials: metallic crystal structures, ceramic crystal structures, imperfections in solids.
- Properties and characterisation: thermal properties, electro-magnetic properties, characterisation techniques (TGA/DTA/DSC, BET, TMA, electro-magnetic characterisation).

**Initial competences**

- Finished with success the studies: bachelor in chemistry / bachelor of chemistry / bachelor of physics and astronomy / bachelor of chemical engineering and materials science / bachelor of bioscience engineering / high school programma bachelor of engineering or show to have obtained the necessary learning outcomes given in these programmes. Successfully finish the course "solid-state chemistry" or having obtained the necessary learning outcomes provided by this course.

(Approved)
Final competences

1. Be able to list the different property classifications of superconducting materials.
2. Be able to draw crystallographic structures of different types.
3. Be able to describe the different synthesis methods for superconducting materials.
4. Be able to argument the pro and contra of the different synthesis methods.
5. Be able to describe the electro-magnetic properties of superconducting materials. Be able to give a short explanation of the measurement techniques to determine electro-magnetic properties.
6. Be able to analyse the thermal decomposition of precursor materials during the synthesis of ceramic materials, using simple thermograms.
7. Be able to give a short description of the technological applications of superconducting materials.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment.

Conditions for exam contract

This course unit cannot be taken via an exam contract.

Teaching methods

Demonstration, lecture

Learning materials and price

Cost: 7.0 EUR Syllabus (dutch) + English copies
Powerpoint slides electronically available (English).

References

Introduction to materials science, Schackelford. Materials science and engineering, William D. Callister.
The physics and chemistry of solids, S. Elliot Introduction to superconductivity and high Tc materials, Cyrot et al.

Course content-related study coaching

Interactive learning education through the on-line learning system Minerva Personal assistance by teacher.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Oral examination

Examination methods in case of periodic evaluation during the second examination period

Oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Oral exam with written preparation.

Calculation of the examination mark

100% final exam