KD2150 Inorganic Materials Chemistry 7.5 credits

Oorganisk materialkemi

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for KD2150 valid from Spring 2011

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Chemical Science and Engineering, Chemistry and Chemical Engineering

Specific prerequisites

Admission requirements for independent students:
75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding. Documented proficiency in English corresponding to English B.

**Admission requirements for programme students at KTH:
**At least 150 credits from grades 1, 2 and 3 of which at least 110 credits from years 1 and 2, and bachelor's work must be completed, within a programme that includes:
75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After having passed the course, the student should be able to:

- describe the relationship between structure and chemical bonding, and from this insight to draw general conclusions about the material's physical properties
- describe how a substance band structure is constructed and from this band structure draw conclusions about the material's electronic conductivity
- describe the most common experimental techniques used for structure determination, and the type of information they can provide and their limitations
- describe the basic principles of X-ray crystallography and how they are applied to obtain an crystal structure at atomic resuolution level
- describe how semiconductors are made, which structures they have and predict the consequences of doping with electron-rich and electron-poor materials
- explain how simple semiconductor devices are constructed and work
- describe the mechanisms of electronic and ionic charge transport in inorganic materials
- describe the atomic or molecular properties that give rise to macroscopic magnetic and optical properties of inorganic materials
- explain the construction of binary phase diagrams and the use of phase diagrams for describing an inorganic binary system's temperature and composition dependence
- present an overview of particle size relevant to the chemical and physical properties of a material
- in projects to immerse themselves in a certain type of material, and oral and written clearly describe the results of their classmates
- plan and carry out a laboratory project in several stages under the supervision comprehensive synthesis, analysis, implementation and reporting

Course contents

- Basiccoordinationchemistryofmetalsandceramics
- Determinationofsolidsstructures, practical useofdatabases
- Electricalproperties ofmetalsandsemiconductors
- Magneticandopticalpropertiesofmaterials
- Productionand characterization ofnewmaterials
- Theoreticalmodelsfor thedescriptionof thematerialfunction

- MaterialsChemistryfor the paperandpulp production
- High performance
- Inorganicmaterialsin biological systems
- Environmentally friendlymaterials

Course literature

Bradley D. Fahlman, Materials Chemistry, 2:nd edition, Springer.

Examination

- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Examination (TEN1; 4,5 credits)
Project work (PRO1; 1,5 credits)
Laboratory course (LAB1; 1,5 credits)

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.