IM2659 Project on Nanomaterials 7.5 credits

Projekt i nanomaterial

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

Establishment

Course syllabus for IM2659 valid from Autumn 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Physics

Specific prerequisites

Attendance to courses

IM2657 Nanostructured Materials and Self Assembly

IM2658 Experimental Techniques - Bulk

Documented chemistry knowledge may give exemption from IM2657

Language of instruction

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

Intended learning outcomes

This course will give hands on experience on bottom-up, solution based, synthesis techniques of nanomaterials and use of standard analytical tools for materials' property evaluation.

After a successful completion of the course, students should be able to:

· Perform an extensive literature survey on the synthesis topic/material of choice.

· Prepare a detailed report on the topic of synthesis/material.

· Design their synthesis experiments for the targeted material of choice.

· Explain the underlying chemical and physical principles of the selected/designed synthesis scheme.

· Perform chemical stoichiometric calculation for the preparation of solutions.

· Apply chemistry lab practices properly

· Prepare a set-up for planned synthesis experiment.

· Perform XRD analysis on the fabricated nanopowder.

· Interpret XRD results and relate it to homogeneity of material.

· Perform microstructure analysis on the fabricated nanopowder.

· Perform thermal analysis on the fabricated nanopowder.

· Interpret TGA thermogram, indicating corresponding physical changes.

· Interpret DSC thermogram, indicating corresponding physical/chemical changes.

· Perform UV-Vis measurements on the fabricated nanopowder (whenever relevant to the project).

· Perform FTIR analysis on the fabricated nanopowder.

· Interpret analysis results from an FT-IR spectrum.

Course contents

This course aims at giving students hands-on experience and chemistry lab practice on solution based chemical fabrication techniques for nanomaterials. Students (in teams of 2-3) will choose a topic among the available list of projects. This project begins with a comprehensive literature search on the fabrication and characterization of the selected material

by conventional routes and advantages vs. disadvantages of the used methodologies: to be presented in the form of a written report.

Disposition

The course will start with a meeting with the course coordinator and the tutors. Project topics will be distributed to the project teams (of 2-3 students).

Teams will then perform a thorough literature survey on the topic, design their own chemical synthesis method, discuss with their tutors, and the proceeed with the set-up and chemical synthesis process. The material will be then characterized by the student using the analytical techniques they are exposed in course IM2658. The course will be completed by a final project presentation.

Course literature

Relevant publications in the scientific literature.

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Equipment

Access will be granted by the tutors in the course.

Examination

- REP1 - Project Report, 2.0 credits, grading scale: P, F
- LAB1 - Lab Work, 3.0 credits, grading scale: P, F
- PRE1 - Final Presentation, 2.5 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.

Final examination, worth 2.5 hp, will be in the form of a presentation on the selected subject, detailing the background, experimental work undertaken and detailed characterization results with proper discussion.

Other requirements for final grade

All parts are COMPULSORY to attend to receive a final grade.

Project Report: REP1 2 hp P/F

Lab Work: LAB1 3 hp P/F

Final presentation: PRE1 2.5 hp P/F

Final grade A-F

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.