

The University of Western Ontario
Chemistry 9546S, Winter 2021
Optical Properties of Solids

Instructor:

Name: Dr. Lijia Liu

E-mail: lijia.liu@uwo.ca

Office: ChB 066

Description:

This quarter course focuses on the phenomenon of light interaction with solids. It covers several core topics on the optical properties of materials. It provides a fundamental understanding on how luminescence (usually at visible region) is generated when a material is excited by an external source. Several representative solid-state material systems will be discussed, such as molecules, inorganic semiconductors, phosphors, quantum dots, and metal nanoparticles. Practical experimental techniques on optical spectroscopy measurements, such as UV-visible absorption spectroscopy, fluorescence spectroscopy, and life-time measurements will also be introduced.

Learning outcome:

Upon completion of this course, students will be able to

- Understand the fundamental physical process of luminescence
- Identify the critical microscopic parameters of a material that determines its light emission property
- Predict how the luminescence of a material can be controlled or modified through chemical/material engineering
- Work from experimental optical spectroscopy data to deduce the microscopic properties of materials

Tentative Topics:

- Introduction
 - ♦ Optical processes
 - ♦ Core concepts in optical physics
- Fundamentals
 - ♦ Absorption processes
 - ♦ Exciton formation

- ♦ Emission processes, luminescence
- Luminescence materials
 - ♦ Molecular materials
 - ♦ Semiconductors
 - ♦ Quantum dots
 - ♦ Metal nanoparticles
 - ♦ Phosphors
- Instrumental and data analysis
 - ♦ Steady-state measurements
 - ♦ Time-resolved measurements

Resources:

No textbook required.

Lecture notes and handouts will be provided as the course proceeds.

Lectures days (tentative):

Days: Monday and Wednesday, First day of class: January 10, 2022

Time: 1:00 pm – 2:30 pm

Mode of instruction: In person

Evaluation

Assignment (30%)

Case study in the form of presentation and written report (70%)

Course attendance and missed/late assignments

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed.

Notes on Academic Honesty

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Health and Wellness

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre.

Numerous cultural events are offered throughout the year. For example, please check out the Faculty of Music web page <http://www.music.uwo.ca/>, and our own McIntosh Gallery <http://www.mcintoshgallery.ca/>. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>. Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html.