

The University of Western Ontario

Chem9774Q: Materials and Synchrotron Radiation I

(Chem9784R, Synchrotron and Materials II will be offered immediately after in Oct., 2022)

Instructor T.K. Sham (tsham@uwo.ca) Room 030A Chemistry, Tel.: ext. 86341

Description Introduction to synchrotron radiation and the X-ray properties of elements

Topics include

- Introduction to synchrotron radiation
- Dual wave and particle properties of photons and electrons
- X-rays, electronic structure of materials, metals, semiconductors and insulators
- Interaction of light with matter, absorption and scattering, relationship to dielectric constant and refractive index
- X-ray properties of elements
- X-ray data (orange) booklet
- X-ray absorption fine structure (XAFS) spectroscopy: Introduction to XANES and EXAFS; Athena and Artemis, software for data analysis,
- Applications of XANES in the elucidation of the structure and bonding of functional materials

Lectures Two 50-minute lectures a week, 12 -13 lectures, in class

Evaluation Problem sets (70 %), written exam, in class, open book (30%)

Course Materials and Delivery (in person, following Western COVID-19 protocol):

No textbook, relevant materials will be distributed in class/online via owl. Several reference books are suggested below.

J. Stöhr, NEXAFS Spectroscopy (Springer, 1992)

Jeroen A. Van Bokhoven and Carlo Lamberti (ed), X-Ray Absorption and X-Ray Emission Spectroscopy: Theory and Applications 2016, |Online |DOI:10.1002/9781118844243

John Evans, X-ray Absorption Spectroscopy for the Chemical and Materials Sciences (Wiley, 2018)

T.K. Sham (ed) Chemical Applications of Synchrotron Radiation (World Scientific, 2002)

Frank de Groot and Akio Kotani, Core Level Spectroscopy of Solids (Taylor & Francis CRC press, 2008)

Grant Bunker Introduction to XAFS (Cambridge University press, 2012)

Jinghua Guo (ed.) X-Rays in Nanoscience: Spectroscopy, Spectro-microscopy, and Scattering Techniques (Wiley-VCH ,2010)

Course attendance and missed tests/exams

Appeals related to information missed due to course absences will not be considered for the basis of a grade appeal.

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. The weight of missed course material will be transferred to the final examination in cases where medical accommodation has been granted.

It is the policy of the Department of Chemistry that when a student takes a test or examination, they have deemed themselves fit to do so. Claims of distress or medical issues after the fact will not be considered for the basis of a grade appeal.

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 the 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.