

Chemistry 400a/b: Current Topics in Chemistry

In 2007-2008 the subject of the course “Current Topics in Chemistry” is

“Interfacial and Surface Chemistry”.

Instructor:	Oleg Semenikhin, ChB 067 osemenik@uwo.ca
Lectures: and In-class Discussions	3 hours per week, Mon 9:30 am, Tue, Thu 10:30am, room ChB115
Weight:	0.5
Description:	The course provides a treatment of basic and advanced concepts of modern interfacial chemistry, electrochemistry and surface science, as well as of experimental techniques of study and characterisation of surfaces and interfaces.
Sources:	<ol style="list-style-type: none">1. Wolfgang Schmickler, Interfacial Electrochemistry, Oxford University Press, 19962. Gary Attard and Colin Barnes, Surfaces, Oxford University Press, 1998
Evaluation:	In-class discussions and assignments (30%); Midterm Exam (30%), Final Exam (40%)
Final Exam:	TBA

Brief Course Outline

Part A. Structure and Properties of Interfaces

1. Basic information about phases. Solid, liquid and gas phases.
2. Surface energy and surface tension. Well-defined (single-crystal) surfaces. Polycrystalline surfaces. Particulate metals and nanoparticles. Formation of a new phase.
3. Solid State. Metals, semiconductors and insulators. Work functions, Fermi levels, Electrochemical and chemical potentials. Structure and thermodynamics of solid-vacuum and liquid-vacuum interfaces.
4. Phases in contact. Interfaces in equilibrium. Contact potential difference. Electrical double layer. Systems containing two and more interfaces.
5. Ideally polarizable interfaces. Structure of the metal-solution and semiconductor-solution interfaces.
6. Adsorption at a solid-gas interface. Adsorption isotherms. Adsorption at a solid-liquid interface.

Part B. Physico-Chemical Techniques for Studying the Interfaces

1. What kind of information do we need to characterize a surface. *Ex-Situ* vs. *In-Situ* techniques.
2. Electron Microscopy, Electron Scattering. Electron Back Scatter Diffraction (EBSD) and Low Energy Electron Diffraction (LEED)
3. X-ray techniques. X-Ray Photoelectron Spectroscopy (XPS), Auger Spectroscopy, X-Ray Fluorescence and Energy-Dispersive X-Ray Fluorescence Analysis (EDX), Grazing X-ray Reflectometry and Near Edge X-ray Absorption.
4. Optical Techniques. Ultraviolet Photoemission Spectroscopy (UPS), Ellipsometry and Electroreflection Spectroscopy. Vibrational Spectroscopy. Reflection-Adsorption Infra-Red Spectroscopy (RAIRS).
5. Surface Profiling: Secondary Ion Mass Spectrometry (SIMS).
6. Scanning Probe Techniques. Scanning Tunneling Microscopy (STM), Atomic-Force Microscopy (AFM).