

SURFACE SCIENCE & NANOTECHNOLOGY

LECTURES

Time & Place – M.W 5:00-6:30 pm, Main Link- EIT 2053 [Total contact hours ~ 24-30 hrs]
Tong Leung Office: C2-066A (Tel: 519-888-4567 ext. 35826) or Lab: C2-059-066 (Tel: ext. 35827). E-mail:
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Available any time or make appointment by e- or voice-mail. Website: <http://leung.uwaterloo.ca>

TEXTBOOKS

References only. Course and exam materials will be based primarily on Leung's Lecture Notes and handouts.

- (1) M.DiVentra, S. Evoy, J.R. Heflin, "Introduction to Nanoscale Science and Technology", Springer, New York (2004) - On Reserve, QC176.8 || (2) G.A. Ozin, A.C. Arsenault, "Nanochemistry", RSCPublishing, Cambridge (2005) - On Reserve, TA418.9.N35 O95x 2005 ||
(3) J.A. Vernables, "Introduction to Surface and Thin Film Processes", Cambridge University Press, New York (2000), On Reserve, QC176.83.V46 2000 || (4) K. Christmann, "Introduction to Surface Physical Chemistry", Springer, New York (1991) - On Reserve, QD50.C47x. || (5) G.A. Somorjai, "Introduction to Surface Chemistry and Catalysis", Wiley, Toronto (1994) - See the 1981 version of Somorjai book, [QD506.S588] - QD506.S588 ||
(6) C. Kittel, "Introduction to Solid State Physics", Wiley, New York (1976) - QC176.K5.

HOMEWORK and MARKS

THREE Problem Sets, plus reading assignments	15 ± 10 %
ONE Term Paper (Week 6-9) and maybe a presentation Maximum page limit: 20 pages	35 ± 10 %
ONE Final Exam	50 ± 10 %
Total	100 %

COURSE OUTLINE

Week	Ref. (1)	Topics
1	1.1-1.3 3.1	Opener: scope and course orientation PHYSICAL STRUCTURE of surfaces and materials: Crystal structure
2		Plane terminology, unit cell and reciprocal lattice; TLK model; other physical properties, lattice vibration, thermal properties
3	4.1	Surface structure determination: LEED, EXAFS and other fine-structure techniques; SPM, AFM, SEM, TEM, etc.
4	4.2, 3.2	ELECTRONIC STRUCTURE of solids: Band theory, Fermi surfaces and metals; semiconductors and insulators, superconductivity
5		Plasmons, polaritons, polarons and excitons Other surface phenomena and physics
6		Electronic structure and surface bonding determination: Photoemission, AES, HREELS, RIR, etc. "HOT" TOPICS (Assign term-paper topics)
7	5.1, 5.2 2.1-2.6	SURFACE REACTIONS: particles-surface interactions, radiation-surface interactions, kinetics studies, TDS, LITD and other radiation induced desorption techniques
8	4.3 5.3- 5.4	Composition analysis: AES, SIMS, TEM, etc. Nanoscale science and technology: Fabrication and catalysis Time-resolved studies
9		Wrap-up
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