

CHEM 588 Physical Methods in Materials Chemistry

Spring, 2008

Tu & Th, 8:30 - 9:50 am

163 Noyes Lab

4 Hours

Course Registration Number 43049

Instructor: Ken Suslick, A420 CLS, 333-2794, ksuslick@uiuc.edu
Office Hours by appointment, anytime.

TA: Hangxun Xu, A427 CLS, 333-1532, xu8@uiuc.edu
Office Hours: Thursday 2-4 pm.

WebSite URL: <http://www.scs.uiuc.edu/chem588/> (which includes last year's lectures)

Textbooks: Watts, John F.; Wolstenholme, John;
An Introduction to Surface Analysis by XPS and AES;
Halsted Press 2003; 212 pages, \$52.50 paperback. [abbreviated as WW]

Goodhew, Peter J.; Humphreys, F. J.; Beanland, R.
Electron Microscopy and Analysis, 3rd Ed.
Taylor and Francis, 2001; 251 pages, \$41.95 paperback. [GHB]

Brown, Michael E.;
Introduction to Thermal Analysis: Techniques and Applications;
Kluwer Academic Publishers 2002; 280 pages, \$64 paperback. [B]

Sing, K.S.W.; Everett, D.H., et al. "Reporting Physisorption Data for Gas/Solid Systems"
Pure & Appl. Chem. **1985**, 57, 603-619. [SE]

+ Other Primary Literature and Current Reviews to be handed out in class.

Grading Policy:

Homework:	50 points possible
Presentation:	100 points possible
Final Exam:	150 points possible

The grading distribution will be B's ~ A's >> C's.

CHEM 588 Physical Methods in Materials Chemistry Ken Suslick**Course Syllabus, Spring 2008**

Date	Topic	Reading Assignments
1/15	Introduction	
1/17	Gas Sorption/Surface Area Measurement	SE (pdf online)
1/22	Gas Sorption/Surface Area Measurement	SE (pdf online)
1/24	No class (NIH)	
1/29	Thermal Analysis	B, 1-19, B, 19-52
1/31	Thermal Analysis	B, 52-89, 139-154
2/5	Polymer Sizing	Handout
2/7	Intro to EM	GHB, 1-40
2/12	TEM	GHB, 66-121
2/14	SEM	GHB, 122-169
2/19	Chemical Analysis by EM, EDS	GHB, 169-214
2/21	Electron Spectroscopy	WW, 1-58
2/26	Intro to the MRL Center for Microanalysis of Materials; Dr. Ivan Petrov	
2/28	Electron Spectroscopy	WW, 1-58
3/4	No Class (PittCon)	
3/6	XPS and AES	WW, 59-112
3/11	No Class (Utah)	
3/13	Chemical Applications of XPS and AES	WW, 79-112, 131-143, 149-164 SUBMIT PRESENTATION TOPICS
3/18	Spring Break	
3/20	Spring Break	
3/25	Mass Spectrometry, SIMS	Handout
3/27	XRD	Handout
4/1	XRD/	Handout
4/3	Electron Microdiffraction	Handout
4/8	No Class (UIA)	
4/10	Student Presentations	
4/15	Student Presentations	
4/17	Student Presentations	
4/22	Student Presentations	
4/24	Student Presentations	
4/29	Student Presentations	
Tuesday, May 6	FINAL EXAM, 7:00-10:00 PM	

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Textbooks and Reserved Books, Spring 2008

Required Textbooks

Watts, John F.; Wolstenholme, John; *An Introduction to Surface Analysis by XPS and AES*; Halsted Press 2003; 212 pages, \$52.50 paperback

Goodhew, Peter J.; Humphreys, F. J. *Electron Microscopy and Analysis*; Taylor and Francis 1988; 251 pages, \$41.95 paperback.

Brown, Michael E.; *Introduction to Thermal Analysis: Techniques and Applications*; Kluwer Academic Publishers 2002; 280 pages, \$64 paperback

Books on Reserve

West, A.R. *Solid State Chemistry and Its Applications*; John Wiley and Sons 1984; 734 pages, \$310 new

Cullity, B. D.; Stock, S. R. *Elements of X-Ray Diffraction*; Prentice Hall 2001; 664 pages, \$118 new

Flegler, Stanley L.; Heckman, John W. *Scanning and Transmission Electron Microscopy: An Introduction*; Oxford University Press 1997; 240 pages, \$54.95 new

Fultz, Brent; Howe, James; Caenepeel, Stefan. *Transmission Electron Microscopy and Diffractometry of Materials*; Springer Verlag 2002; 770 pages, \$89.95 new

Wang, Zhong Lin, Ed.; *Characterization of Nanophase Materials*; Wiley-VCH 2000; 406 pages, \$205.94 new

Haines, Peter, Ed.; *Principles of Thermal Analysis and Calorimetry*; Royal Society of Chemistry 2002; 320 pages

Jenkins, Ron; Snyder, Robert L. *Introduction to X-ray Powder Diffractometry*; Wiley-Interscience 1996
432 pages, \$86.58

Tyson, J.F. *Auger Electron Spectroscopy*; John Wiley and Sons 1985; 394 pages

Brundle, C. R.; Evans, C. A. Jr.; Wilson, S. *Encyclopedia of Materials Characterization*; Butterworth-Heinemann 1992; 800 pages, \$175 new, \$84 used

Holt, D. B., ed.; Kazmerski, L. L., ed.; Yacobi, B. G., ed. *Microanalysis of Solids*; Kluwer Academic Publishers 1994
460 pages, \$199 new

Carter, Barry C.; Williams, David B. *Transmission Electron Microscopy: A Textbook for Materials Science*; Plenum Press 1996; 727 pages, \$83 paperback new

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Student Presentations, Spring 2008

1. The Why

Graduate education is much more “learn-by-doing” than undergraduate education, and this course will embrace that philosophy. The ability to communicate your knowledge in an oral presentation is vital to your professional advancement. Public speaking is an inescapable part of every career. The student presentations are meant to be a learning experience for the presenter and for the audience. The presenter will learn how to focus on a specific topic, how to research it, how to organize the material, and how to present it. You should choose a topic closely relevant to your our research goals (albeit *not* papers from your own research advisor); this has the added advantage of focusing on specific techniques and papers of immediate use in your research.

2. The Presentation

All presentations should be in PowerPoint format with a length appropriate for a 20 minute talk with 5 minutes of questions (i.e., 10 to 20 slides, generally, depending on density per slide: I strongly prefer more slides of lower density.).

3. Presentation Topic.

The presentation should be a single fairly narrow topic based on 2 to 4 recent papers (i.e., within the past 5 years) that develop or make use of a modern physical method in materials chemistry. The topic is your choice with my advice and consent, but in an area relevant to your graduate research; it should not include papers from your own research group, however. Consider this practice for your literature seminar.

4. Handout.

A handout should be prepared from your PowerPoint file. In the Print menu, choose “Handouts” “6 slides per page”. Copies should be made in advance for all members of the class. The last slide should have a bibliography of *all* papers (or websites) used, with all authors, *article title*, journal name, year, volume, opening *and* closing page numbers (or full URL for websites).

At the time of presentation, copies of the original papers and a copy of the talk (on CD or by email) should be given to me (i.e., KSS).

5. Preparation and Guidelines to Presenting a Seminar

See <http://www.scs.uiuc.edu/suslick/seminaronseminars.html>

Proof read your presentation carefully! Grammar and spelling are important, even to a scientist. *Pay attention to the details, please!*

6. Scanning of Images

Scanning of images from articles is appropriate as long as credit is given to the source. Images brought into PowerPoint slides should be 200 dpi JPGs or tiffs unless they are very small (in which case 300 or even 600 dpi may be needed). Do not scan large images at 600 dpi because the file will be too large and projection quality will not be improved (remember that a full screen is at most 1600 x 1200 pixels). Feel free (i.e., do it!) to scan images from textbooks or other sources as background to the techniques used in the papers that you are discussing.

7. Grading

The talk will be graded according to the point scheme shown on the following page. Grading will NOT be set to an arbitrary 90%, 80%, 70% basis.

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Presentation Evaluation Form

Speaker: _____

Title: _____

TOPIC CHOICE

Choice of Specific Topic	1	2	3	4	5
	poor				excellent
Scope of Topic	1	2	3	4	5
	poor				excellent
Title Choice	1	2	3	4	5
	poor				excellent

SPEAKING STYLE

Rate of Presentation	1	2	3	4	5
	too fast/slow				excellent
Enunciation/Pronunciation	1	2	3	4	5
	poor				excellent
Distracting Habits (um uh okay hands)	1	2	3	4	5
	extreme				minimal
Kept Audience Attention (monotonal quiet eye contact)	1	2	3	4	5
	poor				excellent

SLIDE PREPARATION

Slide Design	1	2	3	4	5
	poor				excellent
Legibility of Slide Figs	1	2	3	4	5
	poor				excellent
Text, Font, Style & Grammar (too large too small typos)	1	2	3	4	5
	poor				excellent
Use of Figures and Graphics	1	2	3	4	5
	ineffective				effective
Use of Animation, Motion	1	2	3	4	5
	ineffective				effective

SEMINAR CONTENT

Seminar Organization & Timing	1	2	3	4	5
	poor				excellent
Seminar Thoroughness	1	2	3	4	5
	poor				excellent
Quality of Explanations	1	2	3	4	5
	poor				excellent
Speaker's Level of Understanding	1	2	3	4	5
	poor				excellent
Level of Criticality of Literature	1	2	3	4	5
	poor				excellent

BIBLIOGRAPHY

References, Quality of	1	4	6	8	10
	poor				excellent
References, Quantity of	1	2	3	4	5
	poor				excellent

TOTAL POINTS (OUT OF 100): _____