

Course Syllabus- Surface Analysis Techniques

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Office hour: 10am to 12pm (Fri). You can also send me a mail to make reservations anytime.

Course descriptions

This course is designed to provide a basic understanding of surface analysis techniques and the applications how surface analysis can be utilized in research. In addition to conventional characterization, advanced experimental design for surface analysis, such as synchrotron-based techniques, *in situ* methodologies and time-resolved experiments, are also introduced in this course.

Students learning outcomes

After studying surface analysis techniques, students should have the abilities described as following,

1. To realize the fundamentals and theories of surface analysis, including electron spectroscopy, X-ray absorption spectroscopy, secondary ion mass spectroscopy, scanning probe microscopy, vibrational spectroscopy and gas sorption.
2. To have the abilities to distinguish and apply different surface analysis techniques.
3. To be able to correctly interpret the results of ESCA, AES and XAS etc.
4. To be able to choose and apply suitable surface analysis techniques for their own research topics.

Required texts/materials

Textbook

Surface Analysis- The Principal Techniques 2nd Edition, Edited by John C. Vickerman and Ian S. Gilmore, John Wiley & Sons, Ltd. (2009).

Supplementary materials

Principles of Instrumental Analysis, 7th Edition, Douglas A. Skoog, F. James Holler and Stanley R. Crouch, Cengage Learning (2017).

Journal articles.

Grading

Midterm exam= 30 %, Final exam= 40%, Presentation= 30%

Course outline

Week 1	Introduction to surface
Week 2	Electron spectroscopy for chemical analysis I: Introduction
Week 3	Electron spectroscopy for chemical analysis II: Practical case analysis
Week 4	Auger electron spectroscopy
Week 5	Electron microscopy and related techniques I
Week 6	Electron microscopy and related techniques II: EELS, SAED, EDX and EPMA
Week 7	Secondary ion mass spectroscopy
Week 8	X-ray absorption spectroscopy
Week 9	Midterm exam
Week 10	Surface enhanced spectroscopy- FTIR
Week 11	Surface enhanced spectroscopy- Raman
Week 12	Scanning probe microscopy
Week 13	Gas sorption
Week 14	In situ/operando methodologies
Week 15	Presentation I
Week 16	Presentation II
Week 17	Presentation III
Week 18	Final exam