Spring 2007 Spectrochemical Analysis

CH 660

"*Spectrochemical Analysis* Methods of chemical analysis that depend upon the measurement of the wavelength and the intensity of electromagnetic radiation…"

Encyclopedia Britannica

INSTRUCTOR
Dr. Alexey Shvarev
LECTURES
MWF 9:00 am to 9:50 pm in GBAD 211
OFFICE HOURS
TR 8:30 am to 10:00 am in Gilbert 249

TERMS OFFERED
Spring 2007, Spring 2009

COURSE DESCRIPTION AND OBJECTIVES

Theoretical concepts and methodology of optical spectrochemical methods of analysis, components of Spectrochemical instruments, flame and electrothermal atomic spectrophotometry, ICP atomic emission spectrometry, molecular absorption and fluorescence spectrometry.

Students must demonstrate the ability to state and illustrate the fundamentals of spectrometric measurements (e.g., interactions of radiation and matter) identify the critical characteristics of the primary components of spectrometers (e.g., sources, photodetectors) discuss the factors that affect the quality of spectrometric measurements (e.g., interferences, signal-to-noise ratio) and methods to improve the quality of measurements (e.g., standard addition) discuss and contrast specific spectrometric methods including atomic absorption spectrophotometry, plasma emission spectrometry, ICP/MS spectrometry, UV-visible spectrophotometry (molecular absorption), molecular fluorescence spectrometry) read and critically evaluate a current journal article in spectrochemical analysis

This course is not an experimental course and will not cover the operation of specific instruments.

COURSE MATERIALS
Lecture notes
Spectrochemical Analysis by J. D. Ingle and S. R. Crouch. ISBN 0138268762.

COURSE TOPICS
Near UV-visible-near IR region (200 to 1000 nm) (similar instrumental and optical requirements)
Emphasis on analysis (determining the concentration of trace to major species in a sample)

Not covered:
IR and Raman spectrometry, scattering techniques (covered in CH 567)
NMR, mass spectrometry, X-ray techniques (not in textbook)

Coverage by chapter (see table of contents in textbook):
1-6 general principles, methodology, instrumental components
7, 8, 10 atomic spectrometric techniques
12, 13, 15 molecular spectrometric techniques

GRADING (tentative)
100 pts total.
2 midterms and a final. Each is worth 25 pts.
Problem sets 25 pts.

COURSE HANDOUTS FEE
$7.5

Course Outline/Schedule (to be updated)

Course Weeks	Date	Lecture Topic
1	Monday 04/02	**Introduction. History of classical spectroscopy.**
	Wednesday 04/04	**Analytical process, measurements, errors, statistics.** Figures of merit in spectrochemical analysis.
	Friday 04/06	Systematic and random errors in spectrochemical measurement. sensitivity and low detection limit
2	Monday 04/09	Minimization of systematic and random errors, calibration, and quality control.
	Wednesday 04/11	**Radiation/matter interactions.** Spectrochemical measuremrnts.
	Friday 04/13	Overview of spectrochemical methods. Selection of optical information. Measurement of optical signal.
3	Monday 04/16	**Components of spectrochemical instruments.**
	Wednesday 04/18	
	Friday 04/20	**Optical sources, transducers and measurement systems.**
4	Monday 04/23	
	Wednesday 04/25	**MIDTERM I**
	Friday 04/27	**Signal-to-noise ratio considerations.**
5	Monday 04/30	
	Wednesday 05/02	**Atomic spectroscopy.**
	Friday 05/04	
6	Monday 05/07	**Atomic emission spectrometry.**
	Wednesday 05/09	
	Friday 05/11	
7	Monday 05/14	**Atomic absorption spectrofotometry.**
	Wednesday 05/16	
	Friday 05/18	
8	Monday 05/21	**MIDTERM II**
	Wednesday 05/23	**Molecular spectroscopy.**
	Friday 05/25	**UV-VIS molecular absorption spectrophotometry.**
9	Monday 05/28	
	Wednesday 05/30	
	Friday 06/01	**Molecular luminescence spectrometry.**

10	Monday 06/04	
	Wednesday 06/06	
	Friday 06/08	

Final; Tuesday June 12
9:30-11:30
GBAD 211