Indirect Optical Absorption Spectroscopy: Photothermal and Photoacoustic Methods for Chemical Analysis and Material Characterization

Visiting professor: Prof. Stephen E Bialkowski, PhD (Utah State University, USA)

Course description:

Photothermal and photoacoustic spectroscopies are ultrasensitive spectroscopic methods used to measure the optical absorbance in all states of matter. Analytical signals are fundamentally produced by non-radiative relaxation of optically excited species. Using a statistical treatment of fundamental (quantum or shot) noise, it is shown that photothermal spectroscopy produces enhanced signal-to-noise ratios compared to conventional transmission spectrophotometry under most conditions. This enhancement is particularly great in low absorbance samples.

Syllabus of the lecture subjects (enlisted):

1. An overview of processes producing physical changes that can be used for indirect measurement is first presented.
2. Based on the predictable physical effects, the rationale for constructing several of experimental apparatuses are given along with the related figures of merit.
3. Examples of sample cell construction and optical monitoring configurations are used to illustrate the guiding principles.
4. The next lectures review various studies that both evaluate the basic principles of photothermal spectroscopy and use these principles to extend the realm of measurements available to the spectroscopist. Salient features of the experiments, and in some cases theoretical reports, will be highlighted.
5. Finally, the future of photothermal science will be described from my point of view. This includes ideas for lowering measurement uncertainty, extension of sensitivity and reproducibility, the use of standard reference materials, and the future prospects for materials analysis.
6. Lectures will be based on "Photothermal Spectroscopic Methods for Chemical Analysis" Stephen E. Bialkowski, John Wiley & Sons, New York (1996) ISBN: 978-0-471-57467-5. The book is recommended although not required for successful completion of the course.
7. Student performance will be evaluated based on in class presentation of modern research papers and written exams given during lecture periods.

Projekt „Rozwój interdyscyplinarnych studiów doktoranckich na Politechnice Gdańskiej w zakresie nowoczesnych technologii” jest współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego.

TERMINY ZAJĘĆ			
Data	**Dzień tyg.**	**Godz.**	**Sala**
11 maj 2015	poniedziałek	12.00-15.00	Luwr (Chemia A)
12 maj 2015	wtorek	12.00-15.00	Luwr (Chemia A)
13 maj 2015	środa	12.00-15.00	Luwr (Chemia A)
14 maj 2015	czwartek	12.00-15.00	Luwr (Chemia A)
15 maj 2015	piątek	12.00-15.00	Luwr (Chemia A)

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