

Indiana Section of the Society for Applied Spectroscopy

September / October 2000 Newsletter

ISSAS 200-2001 SEMINARS

The Indiana Section of the Society for Applied Spectroscopy 1999-2000 Seminar Series will begin with a presentation by Dr. Shuming Nie of Indiana University. This will be the first part of the Indiana University – Purdue University exchange program that the ISSAS is planning for the fall. Dr. Nie will be speaking on “Luminescent Quantum Dots for Ultrasensitive Biological Detection and Imaging.” The seminar will be held in West Lafayette at Purdue University in Wetherill Room 201 at 5:00pm on Wednesday, October 4, 2000. Dinner with Dr. Nie will follow after the meeting at Sarge Oak on Main (721 Main Street in West Lafayette). If you are interested in attending the dinner with Dr. Nie, please RSVP to Andrew Szumlas at aszumlas@indiana.edu by Monday, October 2. Contact us if you require directions to the meeting or restaurant.

Our second speaker in the Indiana University – Purdue University

exchange program will be Dr. Scott McLuckey of Purdue University, who will be speaking in Bloomington on Monday, November 6. More details about this seminar will follow in the next newsletter.

We are currently working on our spring seminar schedule. If you have any suggestions for speakers, please contact us at issas@indiana.edu.

SPECTROSCOPY NEWS

Acoustic Droplet Levitation for Cellular Analysis: There are some inevitable problems when studying small populations or individual cells. These include the difficulties of preparing and working with low concentrations, especially when container adsorption occurs. There are also interference problems associated with the optical cell itself. A unique solution to these problems was recently reported by Staffan Nilsson and co-workers at Lund University. By acoustically levitating small droplets of about 500 nL, the researchers were able to isolate 3-15

individual adipocytes. The external pH of the cells was measured through the use of a fluorescent dye, which indicated the cellular response the aerosol introduction of β -adrenergic agonists. The group also made provisions for the introduction of solvent to prevent droplet evaporation. (*Anal. Chem.* **2000**, 72, 3412)

A Colorimetric Artificial Nose:

Work has been done since the 1950's to develop a gas sensor that would mimic the human olfactory system. Although some successes have been reported, a broadly applicable but selective sensor remains a bit elusive. Metalloporphyrin dyes have recently been exploited by Rakow and Suslick at the University of Illinois. This unique class of dyes was used to develop a colorimetric sensor for some common solvent vapors. The sensor showed selectivity for over a dozen compounds, with detection limits as low as 100 ppb reported. (*Nature* **2000**, 406, 710)

THIS MONTH IN SPECTROSCOPY

What commonly used term in spectroscopy did G. N. Lewis coin in October 1920 for quanta of light?

October 1920: In a Letter to the Editor of *Nature*, G. N. Lewis

proposed that the name "photon" be accepted and used to describe quanta of light (*Nature*, 1926, 118, 874). Photons were originally hypothesized as quanta of energy by Planck in 1900 (who received the Nobel Prize in 1918 for this work). In 1905, Einstein associated these quanta of energy with light. G. N. Lewis later wrote in his letter to *Nature* that "It would seem inappropriate to speak of one of these hypothetical entities as a particle of light, a corpuscle of light, a light quantum, or a light quant, if we are to assume that it spends only a minute fraction of its existence as a carrier of radiant energy, while the rest of the time it remains as an important structural element within the atom. It would also cause confusion to call it merely a quantum, for later it will be necessary to distinguish between the number of those entities present in an atom and the so-called quantum number." As a result, Lewis proposed that the term 'photon' should be used to describe a given quanta of light.

Spectroscopy Trivia:

Who discovered a 'new kind of rays' on November 8, 1895?

The answer to this question can be found in next the addition of "This Month in Spectroscopy" or log on to the ISSAS trivia page at <http://www.indiana.edu/~issas/trivia.html>.

ISSAS ONLINE

Please remember to check out our website! The ISSAS homepage will keep you updated on local section and national events as well as provide information about our corporate sponsors. Please visit our site at <http://www.indiana.edu/~issas>.

If you have a non-commercial spectroscopy related website that you would like us to link on our web page please contact Denise McClenathan at dmcclena@indiana.edu.

NEW MEMBERSHIPS

Your local Indiana Section of the Society for Applied Spectroscopy is looking for new members. We invite you to recommend membership to any of your colleagues or students who you may feel would benefit from membership in such an organization. The fee for joining is very reasonable for both professionals and students alike. Membership also includes a subscription to the journal *Applied Spectroscopy*. For further information on ISSAS membership, please feel free to contact us or visit our website at <http://www.indiana.edu/~issas>.

CONTACT INFORMATION

You may contact any of the ISSAS officers via phone (812) 855-7905, email (issas@indiana.edu), fax (812) 855-0958, or write to:

Society for Applied Spectroscopy -
Indiana Section
Department of Chemistry
Indiana University
Bloomington, Indiana 47405

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Indiana Section of the Society for Applied Spectroscopy
2000-2001 Seminar Series

**LUMINESCENT QUANTUM DOTS FOR ULTRASENSITIVE
BIOLOGICAL DETECTION AND IMAGING**

Shuming Nie

Department of Chemistry, Indiana University
Bloomington, Indiana 47405

Metal and semiconductor particles on the nanometer scale have unique optical, electronic, and structural properties that are not available in either isolated molecules or bulk solids. These properties are currently under intense study for potential uses in microelectronics, quantum dot lasers, chemical sensors, data storage, and a host of other applications. Research in our group has recently linked luminescent quantum dots (ZnS-capped CdSe) to biological molecules for ultrasensitive imaging and detection (Chan and Nie, *SCIENCE* 281, 2016-2018, 1998). This new class of luminescent labels is 20 times brighter, 100 times more stable against photobleaching, and 3 times narrower in spectral linewidth when compared with organic fluorescent dyes. Quantum dots labeled with the protein transferrin undergo receptor-mediated endocytosis in cultured HeLa cells, and those dots that were labeled with immunomolecules recognize specific antibodies or antigens. These quantum-dot bioconjugates are expected to have a broad range of biological applications such as ligand-receptor interactions, real-time monitoring of molecular trafficking inside living cells, multicolor fluorescence in-situ hybridization (FISH), high-sensitivity detection in miniaturized devices (e.g., DNA chips), and fluorescent tagging of combinatorial chemical libraries.

5:00pm
Wednesday, October 4, 2000
Wetherill 201
Purdue University
West Lafayette, IN

Post-Seminar Dinner with
Dr. Shuming Nie

Wednesday, October 4, 2000

Seminar

Wetherill, Rm 201
Purdue University
West Lafayette, IN
5:00 pm

Dinner

Sarge Oak on Main
721 Main Street
West Lafayette, IN
(765) 742-5230
6:30 pm

For dinner, please RSVP to Andrew Szumlas
(issas@indiana.edu or (812) 855-7905) by Monday, October 2.

Biographical Sketch

Shuming Nie received a B.S. degree in chemistry from Nankai University in 1983. After a one-year English training in 1984, he entered Northwestern University (Evanston, Illinois) through the US-China Chemistry Graduate Program (CGP). In 1989 he obtained his Ph.D. degree in analytical and physical chemistry under the direction of Professor Richard P. Van Duyne. From 1990 to 1992 he did postdoctoral research in biophysical chemistry with Professor Nai-Teng Yu at the Georgia Institute of Technology, and from 1992 to 1994 he became a Whitaker Foundation Fellow at Stanford University working with Professor Richard N. Zare. In the fall of 1994, he joined the faculty of Indiana University - Bloomington, where he is currently an associate professor in the analytical chemistry division.

His research interests include bioanalytical chemistry, biophysical chemistry, and nanostructured materials. He has published over 45 papers and has presented more than 120 invited talks. He has received a number of honors and awards such as the Distinguished Overseas Scholar Award (National Science Foundation of China) (2000-2002), the BFGoodrich Collegiate Inventors Award (1999), the Beckman Foundation Young Investigator Award (1996-1998), and the Whitaker Foundation Biomedical Engineering Award (1991-1994). He serves on a consultant and a member of the Scientific Advisory Board for Quantum Dot Corporation. He also serves on the review panels of the Beckman Foundation and the National Institutes of Health.



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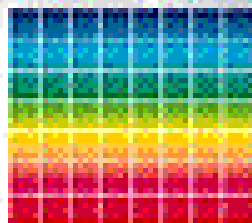
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