# SAS-Chicago

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# March Meeting

**Monday, March 12, 2007**

**The March 2007 meeting will be held at the Wellington Restaurant, located at 2121 S Arlington Heights Rd, Arlington Heights, IL 60005. See the map on the following page.**

**Social Hour: 5:30 - 6:30 PM** **Dinner: 6:30 PM** **Speaker: 7:30 – 9:00 PM**

## SAS Chicago - Student Night

### Time-Resolved Ultraviolet Raman Spectroscopy of Coke Formation

*Presentation by* **Paula M. Allotta**
Department of Chemistry and Center for Catalysis and Surface Science,
Northwestern University, Evanston, Illinois 60208

### Analyte Detection Using Nanowires Produced by On-Wire Lithography via Confocal Raman Microscopy

*Presentation by* **Lidong Qin**
Department of Chemistry
Northwestern University, Evanston, Illinois 60208

### Imaging of Surface-Enhanced Raman Scattering "Hotspots" by the Photochemical Reduction of a Self-Assembled Monolayer

*Presentation by* **Matthew A. Young**
Department of Chemistry
Northwestern University, Evanston, Illinois 60208

Please make your dinner reservations for the upcoming meeting by email at **sas.chicago@bigfoot.com**, by using the form on our web page < **http://www.sas-chicago.org/Online%20Registration%20at%20Wellington.htm**> or by calling Mary Kaplar at **708-449-5767**. Leave **your name**, **company affiliation**, a **telephone number,** the **number of reservations** and **your choice of entree**. Please call by **noon Friday, March 9th**, so that proper arrangements can be made with the restaurant. If you can't attend, cancel by Friday noon: SAS is charged for no-shows.

**Entree choices: London Broil with Bordelaise Sauce, Breast of Chicken with Teriyaki Sauce, or Vegetarian Fettuccine.**

**Dinner Cost Members: $25** **Students and Unemployed Members: $10** **Non-members: $30**

## Time-Resolved Ultraviolet Raman Spectroscopy of Coke Formation

Paula M. Allotta[1] and Peter C. Stair[1,2]
[1]*Department of Chemistry and Center for Catalysis and Surface Science, Northwestern University, Evanston, Illinois 60208*
[2]*Chemistry Division, Argonne National Laboratory, Argonne, IL 60439*

As with many hydrocarbon conversion catalysts, zeolite H-MFI suffers from deactivation due to carbonaceous buildup (coke) during the methanol-to-gasoline reaction. A traditional method for studying coke formation is to dissolve the zeolite and products and extract the soluble components, which are then studied by GC-MS. This method does not give any information about insoluble coke, and the strong acids and bases used during the extraction process may cause chemistry. Raman spectroscopy has advantages over this GC-MS analysis because measurements can be taken *in-situ*. Visible excitation causes strong fluorescence in coke systems and peaks are often undetectable. By shifting the excitation wavelength to the UV region, fluorescence can be avoided, and peak intensities increase due to frequency dependence.[1] Using UV-Raman spectroscopy, reaction products can be monitored as the reaction is occurring. However, heating and cooling is slow (minutes), and coke formation is too fast for real-time UV-Raman measurements. By introducing an infrared laser as the heat source, heating and cooling are much faster, $10^{-6}$ to $10^{-3}$ s. After heating, products and intermediates are trapped inside the zeolite pores and unable to react or desorb. Using this pulse-quench sequence, intermediates can be detected by UV-Raman spectroscopy.

(1) Chua, Y. T.; Stair, P. C., Journal of Catalysis 2003, 213, 39.

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## Analyte Detection Using Nanowires Produced by On-Wire Lithography via Confocal Raman Microscopy

Lidong Qin and Chad A Mirkin
*Department of Chemistry*
*Northwestern University, Evanston, Illinois 60208*

We have developed a new strategy for designing, fabricating, and imaging Raman hot spots in the context of one-dimensional nanostructures prepared by On-Wire Lithography (OWL).[1-3] A combinatorial analysis of these structures provide insight into the electromagnetic mechanism of Surface Enhanced Raman Scattering (SERS). Gold nanodisk arrays with disk thicknesses and interparticle gaps precisely controlled over the 5 nm to many micrometer range were fabricated by OWL and studied by confocal Raman microscopy with methylene blue as a probe molecule. The results demonstrate that disk thickness and gap distance play a crucial role in determining electromagnetic enhancement as determined by local SERS intensities. In contrast to earlier experimental and theoretical work that suggested that the SERS enhancement is largest for junctions with the smallest gap, here we find a non-zero optimum gap size for a specified excitation wavelength that results from the red-shifting of the dipole plasmon wavelength as gap size is decreased. These approaches of using nanowires and Raman spectroscopy open new avenues for detection of analyte and sensing biological and chemical molecules.

(1) Qin, L. D.; Zou, S. L.; Xue, C.; Atkinson, A.; Schatz, G. C.; Mirkin, C. A., Proceedings of the National Academy of Sciences of the United States of America 2006, 103, 13300.
(2) Hurst, S. J.; Payne, E. K.; Qin, L. D.; Mirkin, C. A., Angewandte Chemie-International Edition 2006, 45, 2672.
(3) Qin, L. D.; Park, S.; Huang, L.; Mirkin, C. A., Science 2005, 309, 113.

**Imaging of Surface-Enhanced Raman Scattering "Hotspots" by the Photochemical Reduction of a Self-Assembled Monolayer**

Matthew A. Young and Richard P. Van Duyne
*Department of Chemistry*
*Northwestern University , Evanston, Illinois 60208*

Upon irradiation with green laser light, a self-assembled monolayer of 4-nitrobenzenethiol (NBT) undergoes photochemical reduction to 4-aminobenzenethiol (ABT).[1] It has been shown that this reduction only occurs on surfaces that show surface-enhanced Raman scattering (SERS) activity.[2] In this study, we have followed the photochemical reduction in real time using SERS and used it to generate near-field images of Ag nanoparticles showing specific areas of extra high SERS activity, or hotspots. Additionally, we have explored the use of this photoconversion for ultra high resolution binary monolayer lithography and have performed some investigations into the mechanism of the photoreduction reaction.

(1) Han, S. W.; Lee, I.; Kim, K. Langmuir 2002, 18, 182.
(2) Kim, K.; Lee, I. Langmuir 2004, 20, 7351.

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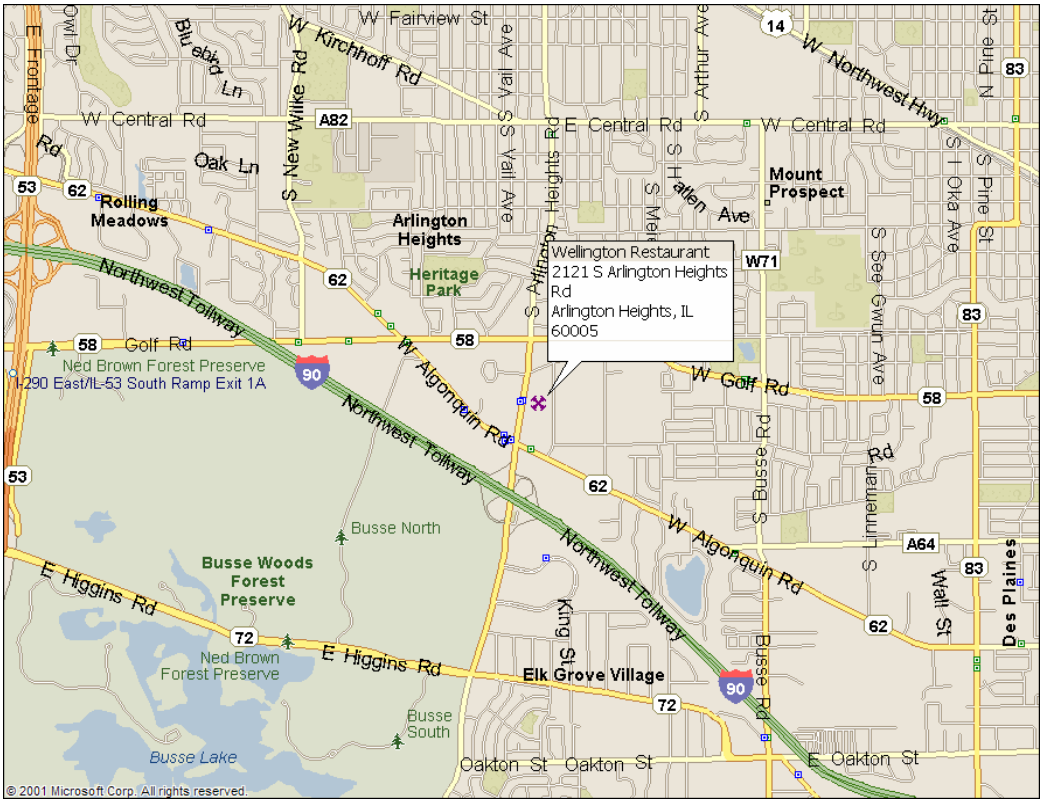
## DIRECTIONS TO THE WELLINGTON RESTAURANT

From Chicago: Take Interstate 90 (Northwest Tollway) west to Arlington Heights Road exit. Proceed north to the restaurant.

From the southwest: Take 355 north to Route 53 north and exit at Algonquin Road east. Go to Arlington Heights Road. Turn left (north) and proceed to the restaurant.



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