



NEWSLETTER

Oklahoma Section American Chemical Society

Volume 11 Number 7

October 28, 2005

Single Walled Carbon Nanotubes. Large-scale Production and Commercial Applications

**Thursday – 17 November, 2005
Oklahoma Room – Student Union
East Central University
Ada OK 74820**

**Dr. Daniel E. Resasco
S. A. Wilson Professor of Chemical Engineering &
George Lynn Cross Professor
University of Oklahoma
Norman OK 73069**

The constant discovery of new and exciting properties of single walled carbon nanotubes [SWNT] keeps amazing the scientific community as well as the general public. SWNT may represent a disruptive technology that could replace a number of familiar materials and enable new technologies due to their remarkable properties. The value of long-term applications of nanotubes can exceed several billion dollars. They could have a huge impact in nanoelectronics, bioengineering, optical devices, nanosensors, nanoactuators, etc. but exactly what applications will materialize is debatable.

On the other hand, there are shorter-term applications that would have a commercial impact today if a source of high-quality low-cost single walled nanotubes existed. Among these applications high strength, lightweight composites are an important type. ----- **[continued page 4]**

[Reservation Information on Page 2]

Schedule:**6:00 PM Social Hour:** Oklahoma Room – ECU Student Union**7:00 PM Meal:** Oklahoma Room – ECU Student Union**8:00 PM Talk:** Oklahoma Room – ECU Student Union**Menu:** Grilled marinated chicken breast with peppers, onions and mushrooms; Fried catfish with pinto beans, steak fries and cole slaw. Dessert: peach & cherry cobbler. Beverage: Coffee; Tea and water.**Cost:** \$14.00-ACS Member; \$6.00-ACS Student Affiliate.**Deadline:** **Friday, 11 November, 2005 - 5:00 PM. Daniel M. McInnes 580.310.5683**
dmcinnes@mailclerk.ecok.edu

Daniel E. Resasco

**S. A. Wilson Professor of Chemical Engineering and George Lynn Cross Professor
University of Oklahoma****EDUCATION:**

- Ph.D., Chemical Engineering, Yale University, New Haven, CT, (1984).
- BS, Chemical Engineering, Universidad Nacional del Sur, Argentina. Dec. 1975.

AWARDS AND RECOGNITIONS:

- **Oklahoma Chemist of the Year. American Chemical Society, October 2004**
- Advancement of Basic & Applied Science Award. Yale Science & Engineering Assoc. April 2004
- G. L. Cross Research Professor April 2003
- Sam Wilson Professor of Chemical Engineering, February 2002
- Regents Award for Superior Research. U. Oklahoma, April 1999
- Outstanding Chemical Engineering instructor. Selected by OU ChE students.
- **May 1997 and May 1999**
- Bernardo Houssay Award for scientific achievement. National Research Council of Argentina, December 1987
- Harding Bliss Prize for excellence in Engineering and Applied Science. Engraved silver bowl. Yale University, May 1984

PROFESSIONAL EXPERIENCE

- Full Professor. [1998 to date]; Assoc. Professor [1993-98] University of Oklahoma, School of Chemical Engineering and Materials Science,
- Senior Scientist. Sun Company Inc., Marcus Hook, PA, 1991-93
- Professor, Chemical Eng. Dept. National University of Mar del Plata, [1984-90]

START-UP COMPANIES

- Co-founder and Chief Scientist. SouthWest Nanotechnologies, producer of high-quality single-walled carbon nanotubes. Company funded by ConocoPhillips, OCAST, NASA, and NSF

PROFESSIONAL SERVICE

Editor Journal of Catalysis, 2001-to date

Member, Editorial Board: Applied Catalysis, 1996-2001

Member Executive Committee, Nanonet Oklahoma [NSF/EPSCOR]

Member, Executive Committee and Chair, Pre and post congress meetings, XI International Congress on Catalysis, Baltimore, 1996

TOTAL NUMBER OF PUBLICATIONS

110 refereed publications; 20 industrial patents; more than 120 presentations and invited talks

FIVE RECENT PUBLICATIONS RELATED TO THE PROPOSAL

- “Polymer Brushes on Single-Walled Carbon Nanotubes by Atom Transfer Radical Polymerization of n-Butyl Methacrylate” Shuhui Qin, Dongqi Qin, Warren T. Ford, Daniel E. Resasco, and Jose E. Herrera, *Journal of the American Chemical Society* [2004], 126, 170-176
- “Narrow (n,m)-Distribution of Single-Walled Carbon Nanotubes Grown Using a Solid Supported Catalyst.” Bachilo, S. M.; Balzano, L.; Herrera, J. E.; Pompeo, F.; Resasco, D.E.; Weisman, R. B. *Journal American Chem. Society* [2003], 125, 11186
- “Raman Characterization of SWNT of Various Diameters Obtained by Catalytic Disproportionation of CO” J. E. Herrera, L. Balzano, F. Pompeo, and D.E. Resasco. *Journal of Nanoscience and Nanotechnology*, 3 [2003] 1-6.
- “Characterization of single-walled carbon nanotubes (SWNT) produced by CO disproportionation on Co-Mo catalysts” W. E. Alvarez, F. Pompeo, J. E. Herrera, L. Balzano, and D. E. Resasco. *Chemistry of Materials* 14 [2002] 1853-1858
- “Relationship Between the Structure/Composition of Co-Mo Catalysts and their Ability to Produce Single-Walled Carbon Nanotubes by CO Disproportionation” J. E. Herrera, L. Balzano, A. Borgna, W. E. Alvarez, D. E. Resasco, *Journal of Catalysis* 204 [2001] 12971.

OTHER RELEVANT PUBLICATIONS

- “A Scalable Process for Production of Single-Walled Carbon Nanotubes [SWNT] by Catalytic Disproportionation of CO on a Solid Catalyst” D. E. Resasco, W. E. Alvarez, F. Pompeo, L. Balzano, J. E. Herrera, B. Kitiyanan, and A. Borgna, *Journal of Nanoparticle Research* 4 [2002] 131-136
- “Synergism of Co and Mo in the catalytic production of single-wall carbon nanotubes by decomposition of CO” W. E. Alvarez, B. Kitiyanan, A. Borgna, and D. E. Resasco, *Carbon*, 39 (2001) 547-558

- “Controlled production of single-wall carbon nanotubes by catalytic decomposition of CO on bimetallic Co-Mo catalysts” B. Kitiyanan, W. E. Alvarez, J. H. Harwell, D. E. Resasco. *Chemical Physics Letters* 317 [2000] 497 📄

[Continued From Page 1]

SWNT increase toughness and strength, impart antistatic behavior and provide shielding from electromagnetic interference, making such composites ideal for applications like computer and mobile telephone housings; by addition of SWNT polymers become electrically and thermally conducting; Other short-term potential applications include ceramic SWNT composites, metal-SWNT composites; body armors, helmets, airframes, rocket nozzles; electrodes for batteries and fuel cells, chemical filters, catalyst supports, hydrogen storage, lithium-ion batteries, and capacitor; flat-panel displays.

However, the development of these commercial applications will remain a dream as long they are made by the laboratory methods available today. The full realization of the technological potential of nanotubes is contingent upon the development of industrial- scale synthesis. An important step in advancing this technology is the development of techniques able to be scaled-up to produce tons of nanotubes per year. We have developed what we call “controlled production”, which implies the ability to control the selectivity towards SWNT by changing catalyst formulations, reactor design, and operating conditions, combined with an effective purification strategy and a quantitative determination of the SWNT obtained. The use of heterogeneous catalysts allowed us to tailor the material in such a way that selectivity and yield are maximized. The method employed involves the disproportionation of CO at moderate pressure and temperature, which result in a scalable, cost-effective process based on fluidized bed reactors that can be readily scaled-up.

50 Year Section Member Awards

The Section’s 2005 50 year members will be honored at the November 17, 2005 Ada meeting. Please try to attend the November ACS meeting and help honor our 50 year Oklahoma Section ACS members.

The 2005 50 year members are:

Dr. K. Darrell Berlin - Stillwater

Dr. Elliot Porter Doane – Oklahoma City

Dr. Floyd Farha Jr – Oklahoma City

New Student Awards

The Oklahoma Section recently created two new awards for undergraduate students. The **Terrill Smith Travel Award** is designed for undergraduates to travel to a regional or national ACS meeting to present a paper or poster. Two awards of up to \$600 will be awarded each year, one for fall travel and one for spring travel. This award is named in honor of Dr. Terrill [Terry] Smith, longtime Oklahoma Section officer and councilor, who retired from UCO in 1999. Terry was a strong supporter of undergraduate research and student affiliates at UCO and in the section.

The **Roger Baldwin Graduate School Award** is designed for undergraduate students who have been accepted to attend graduate school in the chemical sciences. One award of \$500 will be presented each spring. This award is named in honor of Dr. Roger Baldwin, another longtime Oklahoma Section

officer who is retired from Kerr McGee Corporation. The section is able to offer these new awards partially due to Roger's persistent fund-raising efforts associated with the Southwest Regional Meeting in 2003.

Applications for both awards are available from Section officers or on our website, <http://membership.acs.org/O/Oklahoma/Index.htm>. For more information about these awards, contact Gordon Eggleton, geggleton@sosu.edu.

Oklahoma Chemist Award - 2006


Nominations for **Oklahoma Chemist of the Year - 2006** are now being accepted.

Five [5] copies of a single nomination should be sent by **no later than January 20, 2006 to:**

Dr. K. Darrell Berlin
Department of Chemistry
Oklahoma State University
Stillwater OK 74078
405.744.5950 / kdb@okstate.edu

Criteria and Guidelines for the Preparation of the Nomination and For Selection of the Recipient of The Oklahoma Chemist Award.

1. A nomination letter for the candidate by a colleague, friend, etc.
2. A complete, **up-to-date resumé** of the candidate.
3. A two-page **"highlight"** of the candidate's **major accomplishments**.
4. Five [5] letters of support for the nominee.
 - [a] Two [2] letters from colleagues at the candidate's place of employment.
 - [b] Three [3] letters from outside the candidate's place of employment. Letters from individuals with expertise in the candidate's field are especially welcomed.
5. Special information on the candidate is also solicited, especially as to how the candidate has advanced chemistry in the state of Oklahoma.
6. Candidates may be involved in research or in chemical education within the state.

kdb 

Please Note:

A reminder to **all 5 sections**: they agreed to send \$100 each year to support the Oklahoma Chemist Award. The funds are now needed. Please send a check "The Oklahoma Chemist Award Account" to:

Dr. Mitchell D. Refvik – [treasurer for the Oklahoma Chemist Award]
Phillips Petroleum Co,
92-F Phillips Research Center
Highways 60 & 123
Bartlesville, OK 74004

K. D. Berlin, Chair
Oklahoma Chemist Award Committee

| **November 2005 Section Meeting**

Thursday, 17 November, 2005

Oklahoma Room – Student Union

East Central University

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