

*You are
cordially invited
to attend*

The 37th Annual

Harry G. Fair Memorial Lecture in Chemical Engineering

Thursday, March 24, 2011
Seminar – 3:00 P.M.
M-204 Sarkeys Energy Center
100 East Boyd
University of Oklahoma
Norman, Oklahoma

Coffee and refreshments will
be served prior to the lecture.

Accommodations on the basis of disabilities are
available by calling (405) 325-5811.

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Harry G. Fair Memorial Lecturers

- 2011 Peter C. Stair, Northwestern University
- 2010 Juan J. de Pablo, University of Wisconsin-Madison
- 2008 Donald R. Paul, University of Texas at Austin
- 2007 David Mooney, Harvard University
- 2007 John Prausnitz, University of California, Berkeley
- 2006 George Georgiou, University of Texas at Austin
- 2005 James A. Dumesic, University of Wisconsin
- 2004 Robert C. Armstrong, Massachusetts Institute of Technology
- 2003 Nicholas Peppas, University of Texas at Austin
- 2002 Richard C. Alkire, University of Illinois
- 2001 Ralph T. Yang, University of Michigan
- 2000 Enrique Iglesia, University of California, Berkeley
- 1999 George Stephanopoulos, Massachusetts Institute of Technology
- 1998 Stuart L. Cooper, University of Delaware
- 1997 Keith E. Gubbins, Cornell University
- 1996 H. Scott Fogler, University of Michigan
- 1995 Gary L. Haller, Yale University
- 1994 Christopher W. Macosko, University of Minnesota
- 1993 Larry V. McIntire, Rice University
- 1992 Dan Luss, University of Houston
- 1991 E. N. Lightfoot, University of Wisconsin
- 1990 George A. Samara, Sandia National Labs
- 1989 James Wei, Massachusetts Institute of Technology
- 1988 C. Judson King, University of California, Berkeley
- 1987 Eli Ruckenstein, SUNY Buffalo
- 1986 Stuart W. Churchill, University of Pennsylvania
- 1985 John M. Campbell, John M. Campbell & Co.
- 1984 Richard G. Askew, Phillips Chemical Co.
- 1983 B. H. Sellers, Sellers Chemical Co.
- 1982 Lynn T. Reed, Warren Petroleum Co.
- 1981 Robert S. Purgason, Perry Gas Processors
- 1980 A. B. Slaybaugh, Conoco Inc.
- 1979 Charles R. Perry, Perry Gas Cos.
- 1978 Raymond W. Lowe, E. I. DuPont de Nemours
- 1977 Laurance S. Reid, Ball-Reid Engineers Inc.
- 1976 Harry L. Blomquist Jr., Coastal States Gas Co.
- 1975 Stanley Learned, Phillips Petroleum Co.

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Harry G. Fair Memorial Lecture in Chemical Engineering 2011



Peter C. Stair
Chemistry
Northwestern University
Evanston, Illinois, USA

Catalyst Synthesis By Atomic Layer Deposition



Harry G. Fair

Each year, a special lecture is given in memory of Harry G. Fair, an outstanding OU alumnus. Fair was born in Okmulgee, Oklahoma, on June 3, 1916, and earned his bachelor of science degree in chemical engineering in 1939. He joined Phillips Petroleum Co. in 1939 and worked his way up to vice president for supply and transportation, with responsibility for worldwide exchange of crude oil and all transportation facilities. In 1966, Fair joined M.W. Kellogg Co. as executive vice president in charge of all engineering activities. He was named executive vice president of Coastal States Gas Corp. in 1971, a post he held until his death on July 27, 1974. A member of a number of professional societies and a licensed professional engineer, Fair was active in service to society and his alma mater.

This lecture is made possible by the Harry G. Fair Memorial Fund established by his widow, Jane Swift Fair. Arrangements for the lecture are made by the School of Chemical, Biological and Materials Engineering in OU's College of Engineering.

Catalyst Synthesis by Atomic Layer Deposition

Peter C. Stair

Chemistry
Northwestern University
Evanston, Illinois, USA

Atomic Layer Deposition (ALD) has enormous potential for the synthesis of advanced heterogeneous catalysts with control of composition and structure at the atomic scale. The ability of ALD to produce conformal oxide coatings on porous, high-surface area materials can provide completely new types of catalyst supports. At the same time ALD can achieve highly uniform catalytically active metal and oxide phases with (sub-) nanometer dimensions.

Vanadium oxide species supported on high surface area oxides are among the most important catalytic materials for the selective, oxidative conversion of hydrocarbons to useful chemicals. In our laboratory ALD has been used to synthesize both the catalytic vanadium oxide and the supporting oxide on both high surface powders and anodic aluminum oxide (AAO) nanoliths. These materials have been characterized by SEM, XRF, ICP, UV-Vis absorption spectroscopy, Raman spectroscopy and evaluated for the oxidative dehydrogenation (ODH) of cyclohexane.

More recently we have studied the synthesis of supported metal particles and developed what we call "ABC-type" ALD in which metal nanoparticles and support materials are grown sequentially in each ALD cycle. This method makes possible the synthesis of exceptionally small particles, ca. 0.5 nm. Using additional ALD support layers at the conclusion of the growth, the metal particles can be stabilized against sintering while still remaining active at high temperatures and reaction conditions.

Peter C. Stair biography

Peter Stair received a B.S. in Chemistry from Stanford University in 1972 and a Ph.D. from University of California, Berkeley in 1977 under the supervision of Gabor Somorjai. He has been on the faculty at Northwestern University since 1977. He is Professor of Chemistry, Director of the Center for Catalysis and Surface Science and of the Institute for Catalysis in Energy Processes. He is a Senior Scientist in the Chemical Sciences and Engineering Division at Argonne National Laboratory and Deputy Director of the Institute for Atom-efficient Chemical Transformations. His research interests are in the synthesis, characterization, and physical properties of heterogeneous catalysts. He has worked in surface science and in-situ Raman spectroscopy. His goal is to develop fundamental understanding in catalysis science that leads to advances in industrial chemistry and energy technology. He is a past recipient of the Alexander von Humboldt Senior Scientist Award and recipient of the 2010 ACS George Olah Award in Hydrocarbon or Petroleum Chemistry.