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, Okla., 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.

Production of H_2 and Alkanes by Aqueous-phase Reforming of Biomass-derived Oxygenated Hydrocarbons Over Supported Metal Catalysts

James A. Dumesic

Department of Chemical and Biological Engineering
University of Wisconsin–Madison

The production of hydrogen from renewable biomass resources has environmental benefits as global energy production moves toward a "hydrogen society" because the CO_2 produced during this reforming process is recycled during further production of biomass. We demonstrate that H_2 can be produced by reforming reactions of oxygenated hydrocarbons derived from carbohydrates with liquid water at low temperatures (e.g., 500 K). Aqueous-phase reforming over Pt-based catalysts leads to high selectivities for production of hydrogen, whereas reforming over Ni-based catalysts leads primarily to production of methane instead of hydrogen. Addition of tin to Raney-Ni-based catalysts suppresses the rate of methanation reactions, without significantly decreasing the rate of hydrogen production, such that the performance of Raney-NiSn catalysts compares favorably with that of platinum-based catalysts for production of hydrogen. We also show that aqueous-phase reforming can be conducted over bifunctional catalysts, containing metal and acidic components, to produce liquid alkanes. For example, glucose-derived sorbitol can be converted with high yields to hexane. Finally, we show that it is possible to produce even heavier alkanes by this process, such as C_8 – C_{15} alkanes, thereby opening a route for the production of renewable compounds for transportation fuel.

James A. Dumesic biography

James A. Dumesic earned his B.S. degree from University of Wisconsin - Madison and his M. S. and Ph. D. degrees from Stanford University. His Ph. D. work was conducted under the supervision of Professor Michel Boudart. Dumesic then conducted post-doctoral research as a U.S.-U.S.S.R. Exchange Fellow at the Institute of Chemical Physics in Moscow and as a NATO Postdoctoral Fellow at the Centre de Cinetique Physique et Chimique of France. Dumesic joined the Department of Chemical Engineering in 1976 and served two terms as department chair. He has been the Shoemaker Professor of Chemical Engineering, and he is currently the Steenbock Chair in the College of Engineering. Throughout his career, Dumesic has used spectroscopic, microcalorimetric and kinetic techniques to study the surface and dynamic properties of heterogeneous catalysts. Dumesic pioneered the field of microkinetic analysis, in which diverse information from experimental and theoretical studies is combined to elucidate the essential surface chemistry that controls catalyst performance. He has developed microcalorimetric techniques to measure surface chemical bond strengths for adsorbates on metal, oxide and acidic catalysts. He is actively involved in the use of electronic structure calculations to study the structures and reactivities of adsorbed species on metal and metal oxide surfaces. Dumesic's research group currently is studying the fundamental and applied aspects of his most recent discovery dealing with the generation of hydrogen and liquid alkanes by aqueous-phase reforming of oxygenated hydrocarbons derived from biomass.

Dumesic has received a variety of awards and honors in the field of catalysis and chemical engineering. He has been recognized with the Colburn Award and Wilhelm Award from the American Institute of Chemical Engineers, the Emmett Award from the North American Catalysis Society, and research excellence awards from the New York and Michigan catalysis societies. In 1998, he was elected to the National Academy of Engineering. He also has been recognized for his excellence in teaching at the University of Wisconsin with a Polygon Award and the 1995 Benjamin Smith Reynolds Award. In 2002, he was given the Byron Bird Award in the College of Engineering for Excellence in a Research Publication, citing his work in the microkinetics of heterogeneous catalysis. His research accomplishments were recognized in 2003 by the Herman Pines Award of the Chicago Catalysis Society. He was named one of the Top 50 Technology Leaders of 2003 by *Scientific American*, and he received the 2005 Cross Canada Lectureship Award of the Canadian Catalysis Society. He currently is an associate editor of the *Journal of Catalysis*. Dumesic has published more than 270 papers in peer-reviewed journals.

Various information about research conducted by the Dumesic group can be found at the following link: http://www.engr.wisc.edu/che/

You are cordially invited to attend

The 31ST Annual

Harry G. Fair
Memorial Lecture in
Chemical Engineering

Seminar – 2:30 P.M.
Thursday, April 7, 2005
M-204 Sarkeys Energy Center
100 East Boyd
University of Oklahoma
Norman, Oklahoma

Coffee and refreshments will be served prior to the lecture.

Harry G. Fair Memorial Lecturers

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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
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1997 Keith E. Gubbins, Cornell University
1996 H. Scott Fogler, University of Michigan
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1994 Christopher W. Macosko, University of Minnesota
1993 Larry V. McIntire, Rice University
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1984 Richard G. Askew, Phillips Chemical Co.
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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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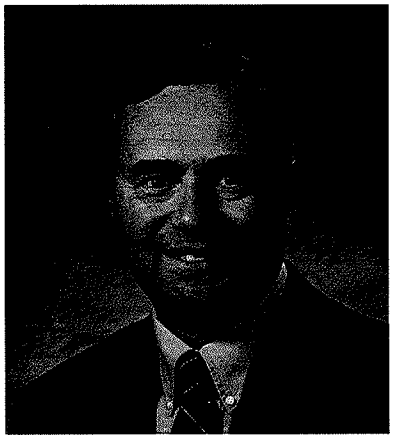

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chemical, biological & materials
university of oklahoma college of engineering