CBE In the News:

- Richard Wool keynote address at the ACS Green Chemistry and Engineering Conference was posted online http://www.youtube.com/watch?v=nHsicXTlxQE
- Jeff Klauda received a NSF CAREER Award! Jeff completed his PhD from the University of Delaware with Stan Sandler as his advisor.

This Week’s Departmental Events:

- You are cordially invited to John Bedenbaugh’s dissertation defense entitled "Investigation of Catalytic Materials for Cracking of Military Aviation Fuel to Liquefied Petroleum Gas: High Throughput Experimentation." The defense will be held on Thursday, August 9th at 2:30 pm in CCM 106. Refreshments will be available at 2:15 pm. An abstract is attached.

Future Department Events:

- Reception in Honor of Mark Barteau and Jingguang Chen
  Friday, August 17th at 4:00pm
  2nd Floor Lobby of Colburn Lab

- CMET Seminar
  Prof. Franziska Gröhn, University of Erlangen-Nurnberg
  Thursday, August 16, 2012
  11:00am in 366CLB
  “Responsive Polymer Nano-Assemblies through Electrostatic Self-Assembly”

Jobs/Recruiting:

- The Institute of Biomedical Engineering, National Tsing Hua University, seeks highly qualified individuals for 1–2 positions in the assistant, associate or full professorship levels. Application portfolio including curriculum vitae, copies of diplomas, copies of undergraduate and graduate transcripts, full publication list, teaching and research plans, contact information (names, mailing addresses, emails, phone numbers) of three referees (only a list is needed upon submission) and the CV at-a-glance (attached) should be sent to Ms. Peggy Sung by September 28, 2012 at the following address:
  Ms. Peggy Sung
  College of Engineering
  National Tsing Hua University
  Hsinchu, Taiwan 30013
  Fax: +886-3-571-2670
  E-mail: chsung@mx.nthu.edu.tw

- 3M Senior Research Engineer - Composites
  Job Summary - Act as research engineer in the 3M Corporate Research Process Laboratory (CRPL), St. Paul, MN. Responsible for developing new process technology for composites materials including composite resin processing, prepreg, filament winding, vacuum infusion and filament winding. Identifies new technology internally and externally, generates intellectual property and reports on technical progress via written reports and oral presentations. Please send your resume directly to: Richard Kollaja
  Sr Technical Manager (rwakollaja@mmm.com)

- The University of California, Davis is looking for an Assistant Professor of Enology and Assistant Sustainable Process Engineer in Viticulture and Enology with teaching, research and outreach responsibilities consistent with the mission of the California Agricultural Experiment Station. The appointment is in the Department of Viticulture and Enology in the College of Agricultural and Environmental Sciences. A joint appointment in the College of Engineering is expected in the
department most closely aligned with the successful candidate’s interests and academic background. See attachment for more information.

Available positions can be found on the Chemical & Biomolecular Engineering opportunity website (http://www.che.udel.edu/biz/OppIndex.html), so be sure to check it regularly.
Investigation of Catalytic Materials for Cracking of Military Aviation Fuel to Liquefied Petroleum Gas: High Throughput Experimentation

John Bedenbaugh

The emergence of military technologies powered by liquefied petroleum gas (LPG) necessitates local fuel production at the point of use. LPG provides distinct advantages over batteries as a mobile energy source due to higher gravimetric energy density and longer operating times. For military applications in remote regions, logistical difficulties and harsh practical limitations make it difficult to obtain LPG through conventional distribution channels. If LPG could be derived from readily available fuels such as Jet Propellant-8 (JP-8), a kerosene-based military aviation fuel, then supply-side logistics would be greatly simplified. Developing a method for conversion of JP-8 to LPG is of critical importance to enable increased deployment of LPG powered technologies.

The aim of the current work is to apply a high-throughput approach for the discovery and optimization of catalysts for production of LPG from JP-8 cracking. To accomplish this goal, a high-throughput experimental set-up was retrofitted for processing of liquid hydrocarbon fuels. The focus of this work was design-specific to the needs of a practical military application. Successful catalysts were to exceed a 5% minimum conversion of JP-8 to C₂-C₄ hydrocarbons, the fuel could not be desulfurized before reaching the catalyst, and no other system inputs were possible. The challenge of sulfur in JP-8 fuel directed the initial exploratory screening to supported nanoparticle catalysts on oxide supports. It was found that oxide solid acidity, including Lewis acid strength, was of primary importance in determining cracking activity. Furthermore, a γ-Al₂O₃ catalyst doped with La produced LPG yields of nearly 10% from JP-8 cracking at a reactor temperature of 650°C.

Aluminosilicate zeolite catalysts having strong solid acidity yielded further improvements in LPG production. ZSM-5 catalysts were optimized for JP-8 cracking activity to LPG through varying reaction temperature and framework Si/Al ratio. The Brønsted acidity and shape-selectivity of the zeolite pore structure contributed to high JP-8 cracking activity. However, the reducing atmosphere required during catalytic cracking resulted in coking of the catalyst and a commensurate decrease in conversion rate. Metal promoters for ZSM-5 catalysts
were explored to reduce deactivation and improve coke burnoff regeneration. It was found that rare earth metals reduced the deactivation rate, and elemental analysis showed less carbon due to coking compared to the base catalyst. Temperature programmed oxidation experiments showed that noble metals reduced onset temperatures for coke burnoff regeneration. A ZSM-5 catalyst promoted with Pt and Gd maintained conversions in excess of 20% on a mass basis at a moderate reactor temperature of 450°C through as many as 14 repeated reaction cycles interspersed with coke burnoff regeneration.

The overall goal of this research work was to demonstrate the utility of a high-throughput approach for systematically accelerating the process of catalyst discovery and optimization. This approach proved highly effective for developing successful catalysts to meet the needs of a fuel processing system for JP-8 cracking to LPG. This work has developed a research framework for investigating complex catalytic processes on a rapid time scale, and the results can be extended to other hydrocarbon-based catalytic cracking systems to create effective energy solutions.
Title: Assistant Professor of Enology and Assistant Sustainable Process Engineer in Viticulture and Enology with teaching, research and outreach responsibilities consistent with the mission of the California Agricultural Experiment Station. The appointment is in the Department of Viticulture and Enology in the College of Agricultural and Environmental Sciences. A joint appointment in the College of Engineering is expected in the department most closely aligned with the successful candidate’s interests and academic background. The position is for an academic year (9-month) tenure-track appointment at the rank of Assistant Professor.

Responsibilities: The appointee is expected to establish a competitively-funded research program relevant to sustainable process engineering in food and beverage production, relevant to the wine industry. Any area of sustainable processing is acceptable, including but not limited to water, energy, emissions minimization, alternative energy generation, or by-product isolation or re-use. The appointee will be responsible for teaching undergraduate and graduate courses related to engineering concepts in winemaking, and other courses as assigned. Mentoring of graduate students, undergraduate student advising, participation in and development of outreach programs, curricular development, and performance of departmental and university service is expected. The appointee is expected to conduct fundamental research, train students and provide outreach that will ultimately support the economic viability of California’s grape and wine industries. The appointee is expected to conduct mission-oriented research and outreach of relevance to the California Agricultural Experiment Station.

Qualifications: Ph.D. or equivalent degree in chemical or biological engineering or a closely-related field. Prior experience in viticulture and/or enology is not a requirement. Evidence of research excellence is expected. The candidate should have the ability to develop and instruct...
undergraduate and graduate courses and the ability to develop and conduct extramurally funded research in engineering as applied to food and beverage production.

**Salary:** Commensurate with experience within the Assistant Professor ranks at the University of California.

**Applications:** Application materials must be submitted via the following website: https://secure.caes.ucdavis.edu/Recruitment/. The position will remain open until filled. To ensure consideration, applications should be received by August 15, 2012.

Materials requested to include: 1) curriculum vitae, 2) publications list, 3) up to three publications, 4) transcripts if the applicant is within five years of degree, 5) statement of research accomplishments, 6) statement of teaching accomplishments and philosophy, 7) statement of future research plans relevant to sustainable processing in the food and beverage industries, and 8) the names, addresses, including e-mail, of three professional references. Additional inquiries should be directed to Professor D. Mills, Search Committee Chair, Department of Viticulture and Enology, One Shields Avenue, University of California, Davis, CA 95616, (530) 754-7821, damills@ucdavis.edu.

*UC Davis is an affirmative action/equal employment opportunity employer and is dedicated to recruiting a diverse faculty community. We welcome all qualified applicants to apply, including women, minorities, veterans, and individuals with disabilities.*
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