

# AICHE-Pittsburgh April Meeting Notice

Wednesday, April 25th, 2012

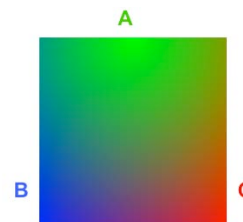
Joint meeting with the ACS-Energy Technology Group (ACS-ETG)

## High-Throughput Studies of Alloy Functional Materials

**James B. Miller, Chemical Engineering Department, Carnegie Mellon University**

The functional properties of alloys are often superior to those of their individual components, accounting for their widespread use in structural, corrosion-control and catalytic applications. Alloy design—selection of components and their relative proportions—is a complex problem that is poorly suited to approaches based on preparation, characterization and testing of a series of single composition samples. However, without a deep understanding of performance across component and composition space, alloy design can become intractable.

To address this challenge, the Gellman group at Carnegie Mellon has developed a high-throughput experimental methodology based on the Composition Spread Alloy Film (CSAF) sample platform, which allows measurements to be made across broad, continuous regions of alloy composition space. CSAFs are thin alloy films with lateral composition gradients across their surfaces (figure); a single CSAF materials library can contain all possible compositions of a ternary alloy,  $A_{1-x-y}B_xC_y$ , or any 2-D plane through a higher-order composition space, on a single compact ( $\sim 1 \text{ cm}^2$ ) substrate. When coupled with strategies for spatially resolved measurement of composition, structure, and functional properties, CSAFs enable rapid construction of composition-structure-property relationships that provide a scientific basis for new materials development.



In this talk, the tools and strategies for quantitative preparation of CSAF sample libraries and for characterization of their properties will be described. Examples will be drawn from our collaboration with scientists at the National Energy Technology Laboratory to illustrate application of the high-throughput approach to characterization of surface segregation, phase behavior and catalytic activity of Pd-alloys used as hydrogen separation membranes.



**James B. (Jim) Miller** is an Associate Research Professor at Carnegie Mellon's Chemical Engineering Department. He earned B.S., M.S., and Ph.D. degrees in Chemical Engineering, all from Carnegie Mellon. He also holds an M.S. in Chemistry from the University of Pittsburgh. Jim's research interests include characterization of surfaces and surface processes for applications in separations, catalysis and chemical sensors. Before joining the CMU faculty in 2006, Jim worked in Pittsburgh-area industry as a developer of chemical sensors, catalysts and catalytic processes. Jim is a Past-Chair of AIChE-Pittsburgh and Past-Chair of the Pittsburgh-Cleveland Catalysis Society (PCCS); he is recipient of AIChE's 2010 "Shining Star"

Award for outstanding volunteerism. Jim also serves as faculty advisor to CMU's AIChE student chapter and its ChemECar team.

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***Location: Spaghetti Warehouse, 26th & Smallman Streets, Strip District, Pittsburgh PA  
Free parking behind the restaurant. Wednesday, April 25th, 2012, Social Hour 6:00 pm, Dinner  
6:30 pm, Talk 7:30 pm.***

***For reservations, please contact Dr. Todd Gardner, Chair, AIChE-Pittsburgh Section, by  
Tuesday, April 24th, 2012 at 304-285-4226 or by E-mail at [Todd.Gardner@NETL.DOE.GOV](mailto:Todd.Gardner@NETL.DOE.GOV).  
Our meetings are open to all.***

The cost of the dinner is \$17 including tax and gratuity. Please specify your preference: spaghetti with meatballs, 15-layer lasagna, four-cheese manicotti, fettuccini alfredo, or grilled chicken Caesar salad. Also, please indicate special needs such as vegetarian, gluten-free, etc.