Materials Science & Engineering Seminar Series

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presents

Material Science Spanning Alloy Composition and Crystalline Orientation

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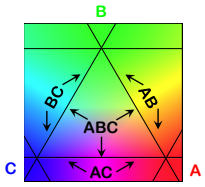
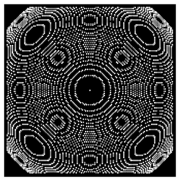
ABSTRACT:
One of the key challenges to systematic study of composition or structure dependent properties of materials is the need for experimental methods and simulation strategies that span multi-dimensional spaces comprehensively; i.e. alloy composition and/or crystallographic orientation. We have addressed the experimental challenge posed by alloys by developing methods for preparation, characterization and property measurement on Composition Spread Alloy Films (CSAFs). These are thin alloy films deposited with lateral composition gradients such that an entire ternary composition space can be represented in a 1 cm^2 thin film; $A_xB_yC_{1-x-y}$, $x = 0 \rightarrow 1$, $y = 0 \rightarrow 1-x$. In the case of structure sensitive surface properties, we use Surface Structure Spread Single Crystals (S^4Cs), curved ingle crystal that expose a continuous distribution of surface orientations. The presentation will illustrate the use of these materials libraries to study a variety of problems in materials and surface science. These include: (1) identifying dimensionally stabilized phases of alloys, phases that occur at the nanoscale that are unstable in the bulk; (2) composition dependence of superalloy corrosion; and (3) structure sensitive chiral surface chemistry.





BIOGRAPHY:
Professor Gellman received his BS in Chemistry from the California Institute of Technology in 1981 and his PhD from the University of California, Berkeley, in 1985. Thereafter, he was an ICI postdoctoral fellow at Cambridge University in Physical Chemistry. He became a faculty member of the chemistry department at the University of Illinois before joining Carnegie Mellon in 1992 where he was appointed the Lord Professor of Chemical Engineering in 1999. Prof. Gellman also holds courtesy appointments in Materials Science and Engineering and in Chemistry. From Jan. 2003 – Nov. 2013 Prof. Gellman served as Department Head of Chemical Engineering. He promulgated a $28 million renovation of Doherty Hall between 2004 -2008. Prof. Gellman organized a consortium involving Carnegie Mellon, University of Pittsburgh, and West Virginia University and in 2007 became the founding Director of the Institute for Advanced Energy Solutions, an outgrowth of the Department of Energy - National Energy Technology Laboratory. In 2012 he was appointed co-Director of Carnegie Mellon's W.E. Scott Institute for Energy Innovation.

Doherty Hall 2210, 11:30AM
Friday, September 15, 2017