

# Brian Gleeson

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*Host: Jerry Floro*

## **Talk Title: " Pitfalls of $\beta$ -NiAl-based Coatings and the Intriguing Prospects of Pt+Hf-Modified $\gamma$ -Ni+ $\gamma'$ -Ni<sub>3</sub>Al Coatings "**

**Date:** Wednesday, August 26

**Time:** 3:00 to 4:00 PM

**Refreshments:** 2:30 to 3:00

**Room:** Wilsdorf 101

### **Abstract:**

Many high-temperature coatings rely on the formation of a continuous and adherent thermally grown oxide (TGO) scale of  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> for extended resistance to degradation. For instance, the durability and reliability of thermal barrier coating (TBC) systems in gas turbines are critically linked to the oxidation behavior and stability of the alumina-forming  $\beta$ -NiAl-based bond coat. The first part of this presentation will discuss some limitations of state-of-the-art  $\beta$  coatings from the standpoint of TBC durability. The second part of this presentation will discuss the development of unique Pt+Hf-modified  $\gamma'$ -Ni<sub>3</sub>Al+ $\gamma$ -Ni coating compositions that form highly adherent, slow-growing TGO scales during both isothermal and cyclic oxidation at high temperature (maximum temperature studied was 1200°C). Moreover, the coatings are highly compatible with the range of Ni-base superalloys used for aero-engine turbine applications. Recent findings on the oxidation and hot-corrosion behavior of Pt+Hf-modified  $\gamma'$ + $\gamma$  coatings (and alloys) will be discussed, together with inferred reasons for the observed "Pt effect."

**Brian Gleeson** received his degrees in materials science & engineering (MSE) from the University of Western Ontario, Canada (BE in 1984; ME in 1986) and the University of California at Los Angeles (Ph.D., 1989). He was a postdoctoral fellow and then a faculty member in the MSE department at the University of New South Wales, Australia, from 1990-1997. He moved to Iowa State University (ISU) in 1998, where, in 2006, he was appointed the Renken Professor of MSE. From 2001-2006 he also served as Director of the Materials & Engineering Physics Program at the USDOE Ames Laboratory, which is managed by ISU. In the fall of 2007 he moved to the University of Pittsburgh (Pitt) to be the Harry S. Tack Chair Professor in the School of Engineering. He is also the Director of

Pitt's Center for Energy. His research interests include the high-temperature degradation behavior of metallic alloys and coatings; phase equilibria and transformations; deposition and characterization of metallic coatings; and diffusion and thermodynamic treatments of both gas/solid and solid/solid interactions. He is Editor-in-Chief of the international journal *Oxidation of Metals* and serves on the International Advisory Board for the international journals *Materials and Corrosion* and *Advanced Engineering Materials*.