J. Allen Haynes

Group Leader
Materials Processing and Joining Group
Materials Science & Technology Division
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831-6063
Phone: (865) 576-2894
Fax: (865) 574-4913
email: haynesa@ornl.gov

Research Interests:

Dr. Haynes joined ORNL as research staff in April 1998. His interests have focused on development, fabrication, characterization, and oxidation testing of high temperature protective coatings, with a particular emphasis on coatings for gas turbine engine applications (including thermal barrier coatings, aluminide bond coatings, and environmental barrier coatings).

Education:

- Ph.D. Materials Engineering, University of Alabama at Birmingham
- M.S. Materials Engineering, University of Alabama at Birmingham, 1995

Research Experience:

- Dr. Haynes currently supervises several chemical vapor deposition laboratories within the Surface Processing & Mechanics Group at ORNL and is principle investigator for a number of DOE projects related to development of high temperature coatings, including:
- Aluminide Bond Coatings: This research, funded by the DOE Advanced Turbine Systems program, focuses on development of advanced NiAl and (Ni,Pt)Al bond coats. The goal of the project is to maximize the adherence of their protective alumina scales in order to enable prime-reliant thermal barrier coatings (TBCs). This research has played a key role in advancing the scientific understanding of the Pt and sulfur effects on oxide scale adherence.
- Advanced Thermal Barrier Coatings: This research, funded by the DOE Advanced Turbine Systems program, investigates the oxidation and degradation of state-of-the-art commercial TBC systems with CVD (Ni,Pt)Al bond coatings. The influences of superalloy composition, bond coat surface preparation and exposure temperature on TBC thermo-mechanical degradation are being systematically evaluated.
- Controlled Oxidation Processing: This project, funded by the DOE Advanced Turbine Systems program, is investigating the potential of controlled-atmosphere oxidation processing to improve oxide scale adherence.

- CVD Mullite Diffusion Barriers: This research, funded by the DOE Microturbines program, focuses on thermodynamic modeling, fabrication, oxidation testing and characterization of CVD mullite coatings for protection of silicon nitride hot-section components within advanced microturbine systems. Current work is evaluating the influence of these coatings on the room temperature and high temperature mechanical properties of the monolithic ceramic substrates.
- Environmental Barrier Coatings: This project, funded by the DOE CFCC program, has investigated numerous candidatecoating systems for protection of SiC/SiC composites in combustion environments. A range of materials including CVD mullite, CVD alumina, plasma-sprayed mullite, plasma-sprayed Na-Zr-P family materials, as well as a number of other systems, have been tested in a high-pressure steam rig at ORNL. The unique testing and characterization facilities allow rapid screening and development of candidate materials.

Professional Activities:

- ASM International
- Guest Editor for Journal of Thermal Spray Technology

Publications:

- Over 30 publications