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TMS2024
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HYATT REGENCY ORLANDO
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#TMSAnnualMeeting



SUBMIT AN ABSTRACT FOR THE FOLLOWING TMS2024 SYMPOSIUM:

MATERIALS SYNTHESIS AND PROCESSING

Functionally Graded Materials, Coatings and Claddings: Toward Microstructure and Property Control

Most industrial applications such as the aerospace, automobile, biomedical and defense areas need materials that must operate in increasingly extreme and complex environments. Usually, no single existing alloy can meet all the requirements of a desired system component. Thus, the successful design and processing of a gradual change in composition and microstructure, and therefore properties, over the whole material is gaining considerable attention in materials science and engineering. Graded materials, coatings and claddings allow for unique combinations of properties to enable various harsh environment, functional and structural applications.

In practice, functionally graded materials (FGMs) are often susceptible to processing defects linked to prohibitively time-consuming, empirical process development without the ability to predictively determine and/or rapidly screen experimentally viable pathways (composition and process parameters) to optimize their production. Due to these limitations, the actual performance of FGMs, relative to conventional parts, remains to be validated and optimized.

This symposium focuses on all aspects of the science and technology, from fundamental science to industrial applications, that will enable control of the microstructure and properties of graded materials coatings and claddings, including:

- thermodynamic, kinetic, property, and microstructure evolution simulations
- rapid processing
- in situ characterization; and understanding defect formation.

Many types of gradient systems are of interest, including from one alloy composition to another, from metals to ceramics, and from intermetallics to metals. Advances in coating technologies, new compositions of coatings, and advanced manufacturing techniques are of interest.

Specific topics include, but are not limited to:

- Fundamental issues and underlying mechanisms in processing FGMs, coatings, and claddings
- Development and demonstration of computational-experimental platforms to produce viable graded components ready for various types of advanced testing
- Novel graded material combinations, coatings, and claddings for targeted applications (i.e., optimized mechanical, functional and corrosion properties)
- Understanding of solidification, phase stability, and phase transformation in FGMs
- Computational prediction of optimal material gradients and properties with minimal processing defects, such as porosity
- Advanced processing methods for FGMs, coatings, and claddings: additive manufacturing, physical vapor deposition, pack cementation, slurry c coating, powder-based laser deposition, cold spray, thermal spray, and friction stir processing
- Novel techniques and characterization methods for rapid FGM, coating, and cladding optimization

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