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TMS2019
 148th Annual Meeting & Exhibition

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March 10–14, 2019
 San Antonio, Texas, USA

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ADDITIVE TECHNOLOGIES

Additive Manufacturing: Materials Design and Alloy Development

Additive manufacturing technologies are revolutionizing not only modern component design but also materials design and evolution across many industries. Conventional alloys are designed based on constraints of conventional materials processing and manufacturing technologies such as casting, forging, and hot rolling or sheet metal forming. Additive manufacturing technologies, however, provide different freedoms and limitations in alloy design and development. Direct Metal Laser Melting (DMLM), Electron Beam Melting (EBM), and Direct Energy Disposition (DED) processes are fundamentally working based on the solid to liquid, and liquid to solid phase transformations in each process layer. However, the unique solidification conditions during these processes have made expanding current conventional alloys to Additive Manufacturing difficult and made the introduction of new designed materials a technology challenge.

Difficulties of interest include hot tearing and solidification cracking, secondary deleterious phase formation, porosity and vaporization, melt-pool stability, etc. Understanding the materials responses and behavior as well as the phase transformation phenomenon in these processes are the key and crucial concepts to the adoption of these additive manufacturing methods.

The goal of this symposium is to highlight research in two major materials development categories with a focus on how a fundamental understanding of the thermodynamic and kinetic boundary conditions, as well as using ICME approaches, and Artificial Intelligence enable introducing new alloy systems for additive manufacturing.

Technical sessions are planned emphasizing the two following categories:

- Existing alloys adapted to/modified for additive manufacturing
- New/novel alloys designed for additive manufacturing

Both experimental and modelling submissions are encouraged, especially in which modelling or theory is applied and validated experimentally. Materials systems of interest include structural materials, different types of steels, aluminum, titanium, nickel, cobalt, and copper, high-entropy alloys, and bulk metallic glasses. Submissions in the area of functional materials for AM will also be considered.

ORGANIZERS

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Nearly 4,000 presentations are planned at more than 80 symposia at TMS2019.

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