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Special Issue on Acceleration of Alloy Design via Physical Process Simulation

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Editorial Objectives

Materials Performance and Characterization is published online by ASTM International, a nonprofit technical organization that develops and publishes voluntary consensus standards and related information for materials, products, systems, and services. Contributions are peer reviewed prior to publication.

Purpose and Scope

The journal publishes high-quality, original articles, including full papers, review papers, and technical notes, on both theoretical and practical aspects of the processing, structure, properties, and performance of materials used in mechanical, transportation, aerospace, energy systems, and medical devices. These materials include metals and alloys, glass and ceramics, polymers, composite materials, textiles, and nanomaterials. The journal covers topics related to the integrity of materials which encompasses mechanical testing, fatigue and fracture, corrosion, wear, and erosion, as well as the integrity of components and systems such as rolling element bearings, piping and pressure vessels, fasteners, space technology, and nanotechnology. The journal publishes articles on both qualitative and quantitative methods used to characterize materials including all forms of microscopy, chemical analysis, and nondestructive evaluation.

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Overview

Special Issue on Acceleration of Alloy Design via Physical Process Simulation

Materials producers and researchers are continually being pushed by intense competitive pressures to develop and manufacture new products that are stronger, lighter, more formable, and less expensive. To be successful in the marketplace, these new materials must also exhibit additional properties such as weldability, coatability, corrosion resistance, surface appearance, wear resistance, castability, fatigue resistance, energy absorption, and property repeatability. Unfortunately, many of these design goals tend to be mutually incompatible. Alloy and processing strategies which improve strength generally have a negative impact on formability and weldability, whereas strategies to improve mechanical properties typically have a negative impact on overall material cost.

This leaves the materials researcher the difficult task of optimally balancing material properties for each specific end use. Given the number of design goals and process inputs involved, designing a new material becomes a long, daunting, and expensive task. Physical Simulation allows the researcher to reduce the cost and increase the speed of the necessary development work while avoiding the risk and disruption of full scale mill trials.

The 8 peer reviewed articles in this Special Issue on Acceleration of Alloy Design via Physical Process Simulation present an overview and some of the most up to date research on the use of Physical Simulation to speed new and improved materials to market, while simultaneously reducing the cost required to do so. The material covered in this issue will help materials researchers the world over to understand the applications of Physical Process Simulation to material and process development challenges.

We wish to extend a sincere and heartfelt thank you to everyone who was involved in making this publication possible. The first thanks go to the authors who have agreed to freely share the results of their research efforts; however, we also wish to extend our sincere thanks to the reviewers, editors, and publication staff. This Special Issue would not have been possible without their hard work and dedication.

Brian Allen, Ph.D., P.E.
Chief Metallurgist
Dynamic Systems Inc.
Brian.Allen@Gleeble.com
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