

SUBMIT AN ABSTRACT FOR THE FOLLOWING SYMPOSIUM

DATA-DRIVEN AND COMPUTATIONAL MATERIALS DESIGN

Towards Sustainable Process Modeling, Design, and Operation

Sustainable manufacturing can be defined as approaches across the entire product manufacturing value chain that minimize energy intensity and cost, conserve energy, and mitigate negative environmental impacts. Recent evolution of the computing power and advances in numerical modeling techniques have led to the development of more accurate process modeling software for materials processing, spanning from the extraction of raw materials to the shaping - casting, welding, sintering - and heat treatment of final products. However, industry currently lacks the knowledge and tools to effectively integrate and measure sustainability in materials and manufacturing process design and operation. This challenge is exacerbated by the complex nature of the technological and economical interactions across industrial materials processing and manufacturing value chains. This symposium aims to highlight sustainable practices developed and applied in the general area of materials processing, and strategies for integrating them into materials and manufacturing process design and operation.

The scope of the symposium includes computational methods and other process modeling methods for attaining a sustainable process design and operation.

Topics of interest include, but are not limited to:

- Energy Efficiency Methods for reducing energy consumption, optimizing energy flows.
- Sustainable Process Optimization Multi-objective modeling to balance energy, environment and economic impacts of manufacturing through optimized yields.
- Waste Minimization and Resource Recovery Techniques for eliminating, reducing, and recovering waste in materials processing.
- Digital Tools and AI for Sustainability Software, databases, and AI-driven tools for real-time process optimization, and for evaluating process performance in terms of sustainability and environmental impact
- Process Integration and Sustainable Workflow Design Sustainable design strategies through data-driven process integration, including material and energy flow analysis.
- Industrial Implementation & Case Studies: Applications of sustainable manufacturing, including case studies and best practices, in metal casting, additive manufacturing, and advanced materials processing for sustainability.

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