Special Issue

Mechanical Behavior and Multiscale Modeling of Advanced Structural Materials

Message from the Guest Editor

Advanced structural materials—such as titanium alloys, magnesium alloys, and high-entropy alloys—are essential for lightweight and high-performance applications in aerospace, automotive, and energy sectors. Despite their outstanding strength-to-weight ratios and corrosion resistance, predicting their mechanical behavior under complex service conditions remains a major challenge. This Special Issue focuses on recent advances in understanding the microstructure–property relationships of such materials through integrated experimental and multiscale modeling approaches. Topics of interest include, but are not limited to, the following:

- Deformation and failure mechanisms under extreme environments.
- The role of defects, phase transformations, and interfaces.
- Multiscale simulations (e.g., CPFEM, molecular dynamics, phase-field).
- In situ testing, advanced microscopy, and characterization techniques.
- Data-driven or AI-assisted modeling and material design.

We welcome original contributions that combine experimental insight with simulation to explore the mechanical performance, durability, and design potential of advanced structural materials.

Guest Editor

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Materials (ISSN 1996-1944) was launched in 2008. The journal covers twenty-five comprehensive topics: biomaterials, energy materials, advanced composites, advanced materials characterization, porous materials, manufacturing processes and systems, advanced nanomaterials and nanotechnology, smart materials, thin films and interfaces, catalytic materials, carbon materials, materials chemistry, materials physics, optics and photonics, corrosion, construction and building materials, materials simulation and design, electronic materials, advanced and functional ceramics and glasses, metals and alloys, soft matter, polymeric materials, quantum materials, mechanics of materials, green materials, general. *Materials* provides a unique opportunity to contribute high quality articles and to take advantage of its large readership.

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