

Special Issue

Advanced Theoretical Technology for Understanding Microstructures and Mechanical Properties of Alloys

Message from the Guest Editors

Alloys are the backbone of modern engineering, enabling advancements in aerospace, automotive, energy, and biomedical applications. Their performance is governed by intricate microstructural features—such as grain boundaries, dislocations, precipitates, and phase interfaces—that directly influence mechanical properties like strength, ductility, and fracture resistance. Understanding these microstructure–property relationships at the atomic scale remains a critical challenge in materials science. This Special Issue seeks to highlight cutting-edge research leveraging advanced theoretical approaches to unravel the interplay between microstructures and mechanical behavior in alloys. Topics of interest include phase stability, solute–defect interactions, interfacial properties, dislocation dynamics, and predictive modeling of alloy performance. Contributions bridging computational methods with experimental validation, machine learning-enhanced frameworks, or multiscale modeling techniques are particularly encouraged.

Guest Editors

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Deadline for manuscript submissions

30 June 2026



Metals

an Open Access Journal
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Impact Factor 2.5
CiteScore 5.3



mdpi.com/si/231670

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About the Journal

Message from the Editor-in-Chief

Metallic materials play a vital role in the economic life of modern societies; contributions are sought on fresh developments that enhance our understanding of the fundamental aspects related to the relationships between processing, properties and microstructure – disciplines in the metallurgical field ranging from processing, mechanical behavior, phase transitions and microstructural evolution, nanostructures, as well as unique metallic properties – inspire general and scholarly interest among the scientific community.

Editor-in-Chief

Prof. Dr. Yong Zhang

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