Special Issue

Studies on Formability and Deformation Behavior of Lightweight Alloys

Message from the Guest Editor

Lightweight alloys have garnered significant attention in modern engineering due to their exceptional strength-to-weight ratios, corrosion resistance, and potential for energy-efficient applications in the aerospace and consumer electronics industries. However, their widespread adoption is often hindered by challenges related to formability and complex deformation behavior during manufacturing processes, such as stamping, forging, or extrusion. Recent studies focus on characterizing deformation mechanisms through experimental and computational approaches. Advanced mechanical testing, including tensile, compression, and forming limit experiments, coupled with microstructural analysis via electron microscopy and X-ray diffraction, reveals insights into dislocation dynamics, twinning, and phase transformations. Finite element modeling and crystal plasticity simulations further aid in predicting formability limits and optimizing process parameters. Additionally, innovative techniques, such as warm forming, hydroforming, or electromagnetic pulse forming, are being explored to enhance ductility by activating additional slip systems or mitigating residual stresses.

Guest Editor

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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.

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