

Special Issue

Self-Organization in Plasticity of Metals and Alloys

Message from the Guest Editors

Numerous studies over the past three decades have shown that the self-organization of crystal defects is a fundamental property of plastic flow in solids, which leads to phenomena similar to those observed in complex systems of various natures. In plasticity, these phenomena are often confined to mesoscopic scales and do not manifest themselves on the macroscopic scale of mechanical behavior of bulk samples. This constraint ensures the success of the continuous approach to plasticity, in which the transition from the microscopic description of the motion of individual dislocations to the macroscopic behavior of materials is based on an appropriate averaging. However, this approach becomes insufficient when the local heterogeneity of plastic deformation cannot be neglected. Thus, the consideration of collective effects in the "micro–macro" transition constitutes a key element to further progress in the understanding and modeling of mechanical behavior of solids. The aim of this Special Issue is to collect in one place various findings, often contradictory, and various approaches to this challenging problem.

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Message from the Editorial Board

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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