Special Issue

Laser Shock Peening: From Fundamentals to Applications

Message from the Guest Editors

Laser shock peening (LSP) has emerged as a promising laser-based surface treatment technology featuring high pressure, high energy, ultra-fast , and ultra-high strain rate. LSP enhances the wear, corrosion, and fatigue performance of metals by inducing severe plastic deformation, creating a gradient microstructure, work hardening, and beneficial compressive residual stress. In recent decades, LSP has been widely applied in industries such as aerospace, nuclear, and biomedical fields. Research has explored the relationships between surface integrity, microstructure, properties, and the LSP process, driving increasing demand for this technology.

This Special Issue focuses on LSP's mechanisms, innovations, and applications, including surface integrity, microstructure, properties, simulation, quality monitoring, and processing windows. It also covers developments like ultra-short-pulse, micro-scale, and multi-energy-field assisted LSP, and its application in additive manufacturing. Reviews on mechanisms, laser systems, microstructural evolution, engineering performance, challenges, and future trends in LSP are welcome.

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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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