# Special Issue

# Fatigue and Fracture of Metals Processed by Additive Manufacturing

## Message from the Guest Editors

Additive manufacturing (AM) of metallic materials has emerged as a transformative technology, offering unparalleled design flexibility and enabling the fabrication of complex, lightweight structures. However, the long-term fatigue performance of AM metals remains a critical challenge, especially for safety-critical applications such as aerospace engines, gas turbines, and high-speed rail systems, where components are subjected to very-high-cycle fatigue (VHCF) loading ($10^7$–$10^{10}$ cycles). This Special Issue aims to highlight the urgent need to understand and model fatigue behavior in AM metals, particularly under long-term use. We invite contributions that explore the unique fatigue mechanisms in AM materials and propose novel experimental, theoretical, and computational approaches. Topics of interest include, but are not limited to, the following:

- Advanced characterization of defect-induced crack initiation.
- Multiscale and microstructure-sensitive modeling of fatigue behavior.
- Environmental and thermo-mechanical effects on long-life fatigue.
- Integration of machine learning and data-driven methods in fatigue life prediction.

## Guest Editors

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## Deadline for manuscript submissions

31 December 2025

**Metals**

**an Open Access Journal by MDPI**

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**CiteScore 5.3**

mdpi.com/si/243390

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# About the Journal

## 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.

## Editors-in-Chief

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manuscripts are peer-reviewed and a first decision is provided to authors approximately 18 days after submission; acceptance to publication is undertaken in 2.6 days (median values for papers published in this journal in the first half of 2025).

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