

## Special Issue in High Temperature Materials and Processes

### Cutting-Edge Processes and Material Integration: Next-Generation Alloys and Composites for Extreme Environments

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#### AIM AND SCOPE

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The central goal of this Special Issue is to collate high-quality research that unveils novel approaches to the synthesis, characterization, and performance evaluation of hybrid materials – where state-of-the-art alloys are combined with engineered composites to deliver superior functionality at elevated temperatures. The issue seeks contributions that explore innovative processing methods (including additive manufacturing, advanced casting techniques, and surface engineering), enhanced microstructural design, and multi-scale modelling, all aimed at improving the thermal stability, wear resistance, and mechanical integrity of these materials. Topics of interest include, but are not limited to, the following:

- Development of high-performance multi-phase alloys.
- Integration strategies for alloy-composite hybrid systems.
- Surface modification and coating technologies to extend material lifetimes under extreme conditions.
- Implementations of optimisation techniques in processing and outcomes

This Special Issue intends to push the boundaries of conventional materials design and provide a collaborative platform for researchers and engineers from diverse fields to share their discoveries and ideas.

#### SUBTOPICS

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##### **Nano-Reinforced Hybrids for Enhanced Thermal Stability:**

This subtopic invites studies on the integration of nanomaterials (such as graphene, nano-oxides, and carbides) with alloys and composites. The focus is on leveraging nanoscale reinforcements to improve heat dissipation, mechanical strength, and resistance to thermal shock, thereby advancing the operational limits of high-temperature materials.



**Surface Coatings and Protective Engineering:**

Research addressing innovative surface engineering techniques—such as plasma spraying, laser cladding, and advanced oxidation-resistant coatings—will be welcomed. These studies are crucial for safeguarding alloy-composite systems from high-temperature corrosion and oxidation, extending their operational lifespans in harsh environments.

**Additive Manufacturing of Hybrid Materials:**

Contributions exploring layer-by-layer fabrication techniques for complex hybrid structures are highly encouraged. This subtopic focuses on the benefits of additive manufacturing, including the ability to tailor microstructures and material properties, which can significantly enhance the performance of hybrid alloys and composites.

**Thermal Barrier Systems and Insulation Strategies:**

This area of interest targets innovations in thermal barrier technologies and insulation materials that are essential for managing heat transfer effectively in high-temperature applications. The development of advanced thermal barriers that incorporate hybrid materials is poised to revolutionize energy efficiency and safety in extreme conditions.

**Modelling and Simulation of Thermo-Mechanical Behaviours:**

Computational studies that offer insights into the integrated behaviour of alloy-composite systems under high thermal and mechanical loads are welcomed. Such contributions should aim to predict failure mechanisms, optimize material design, and ultimately guide experimental validations and process improvements.

## HOW TO SUBMIT

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Before submission authors should carefully read the Instruction for Authors. In order to make the preparation of manuscript easier, you are advised to use the Manuscript Template.

All submissions to the Special Issue must be made electronically via the Editorial Manager submission and tracking review system.

All manuscripts will undergo the standard peer-review process (single-blind, at least two independent reviewers). When entering your submission via online submission system please choose “SpecialIssue\_Cutting-Edge Processes and Material Integration: Next-Generation Alloys and Composites for Extreme Environments”.

The deadline for submissions is 31 January 2026, but individual papers will be reviewed and published online on an ongoing basis.

Articles submitted to this special issue are subject to a EUR 250 reduction in the article processing charge.

In case of any question please contact Ms. Joanna Kosińska, Managing Editor of High Temperature Materials and Processes, [Joanna.Kosinska@degruyter.com](mailto:Joanna.Kosinska@degruyter.com)