

## Special Issue

# Sustainable Ironmaking and Steelmaking: Challenges and Opportunities

### Message from the Guest Editor

The iron and steel industry is a cornerstone of global industrialization. As climate change mitigation becomes increasingly urgent, the development of sustainable ironmaking and steelmaking technologies has emerged as a critical priority. This Special Issue focuses on the latest advancements and innovations in low-carbon metallurgy and intelligent metallurgy. Low-carbon metallurgy encompasses both the optimization of traditional integrated steelmaking routes and the adoption of breakthrough short-process technologies. For the conventional blast furnace–basic oxygen furnace (BF–BOF) route, key strategies include oxygen-enriched operation together with top gas recycling, hydrogen reduction, the utilization of low-carbon ferrous burden, carbon capture and utilization (CCU), and using alternative carbon sources such as biomass. Meanwhile, short-process routes, such as hydrogen-based direct reduction (H<sub>2</sub>-DRI) coupled with electric arc furnaces (EAFs), are gaining traction as they significantly reduce reliance on fossil fuels. In parallel, intelligent metallurgy is revolutionizing the industry through integrating artificial intelligence (AI), big data, and advanced automation.

### 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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