

Special Issue

Computational Fluid Dynamics Modeling and Simulation in Material Processing and Metallurgy

Message from the Guest Editors

Metallurgical engineering underpins national industrial infrastructure. With steel and non-ferrous production being major GDP contributors. Computational Fluid Dynamics (CFD) now enables transformative decoding of complex transport phenomena—from multiphase flows to reaction kinetics—governing yield, defect formation, and energy consumption. This Special Issue seeks to publish research advances where modeling and simulation are integral to systems analysis of steelmaking, non-ferrous smelting, and casting processes. We also solicit high-impact studies on novel CFD methodologies and their industrial applications in addressing critical challenges within steel manufacturing and related fields. Topics include, but are not limited to, the following:

- Steelmaking and Refining: BOF/EAF operations, ladle/tundish metallurgy (gas stirring, desulfurization) and inclusion behavior control.
- Non-Ferrous Processing: Aluminum/copper electrolysis, anode furnace dynamics and impurity segregation.
- Emerging Techniques: AI/ML-accelerated simulations, LES/DES turbulence modeling and multiphase flows (VOF, DEM-CFD).
- Simulation techniques, software, algorithms, or other tools for modeling and simulation.

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