

MSE 2024

24 - 26 Sep 2024 (Darmstadt)

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Topic I: Circular Materials

I04: Sustainable Production and Processing of Metals

Metals play salient roles in our society and civilization. However, their production consumes ~8% of the global energy and at the same time generates ~30% of industrial CO₂-equivalent emissions, becoming an unfavorable cause of global warming. While the primary metal production from ores with more than 70% share is mainly responsible for these CO₂ emissions, secondary production via recycling of metal scrap is less intensive in energy consumption and CO₂ emissions. However, metal recycling alone cannot fulfill the future market demands, as they are forecast to further increase at least until the end of the century. Besides, an increase in recycling fraction lead to accumulation of impurity elements in metals, deteriorating product quality and possibly leading to downcycling. Therefore, advances in both carbon-lean primary and secondary metallurgical approaches are urgently needed to mitigate the negative environmental impact and enable circular metals.

This symposium focuses on fundamental and applied research in the field of sustainable metallurgy to support the disruptive technology shifts in the metal industry (incl. steel, aluminum, nickel, manganese, titanium, etc.). Topics of particular interest include, but are not limited to:

- Sustainable metallurgy approaches of ferrous and nonferrous metals using renewable energy resources, e.g., renewable hydrogen and electricity, biomass, etc.
- Alloy designs which enable the usage of increased scrap fractions and metallurgical approaches addressing the issue of accumulating impurities in recycled metals
- Strategies for efficient utilization of low-grade input materials and industrial wastes in metallurgical sectors
- Fundamental understanding of physical, chemical, and mechanical phenomena in sustainable metallurgical processes
- Development and application of advanced instrumentations for in-situ and in-operando experimentation during sustainable metallurgical processes
- Data-driven prediction and optimization of metallurgical processes
- Re-use and re-manufacturing approaches for construction metals

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