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Editorial: Innovators in structural materials—alloys and metals

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Editorial on the Research Topic
Innovators in structural materials—alloys and metals

Structural Materials is a rapidly evolving research domain, driven by fundamental breakthroughs and feats of significant ingenuity and innovation. None of these advancements would be possible without the talented community of researchers working across the world, from Nobel Prize winners to rising stars. The Research Topic *"Innovators in structural materials–alloys and metals"* aims at presenting a series of articles summarizing recent achievements regarding fundamental understanding and technological innovations in alloys and metals for applications as structural materials. The Research Topic comprises 7 peer-reviewed articles, including one review article, one perspective and five research articles, which cover steels, Mg alloys, Ti alloys, Ni alloys, superlattice and intermetallics. The review article by Yan et al. gives an in-depth overview of the microstructural, textural, and mechanical effects of high-pressure torsion processing (HPT) on Mg alloys. Principles of HPT and the effects of HPT on microstructural and textural evolution, and mechanical properties are thoroughly reviewed. Several novel HPT processes are summarized and discussed, such as dynamic high-pressure torsion. Future endeavors are directed to small-scale production, heterogeneous deformation, and demanding requirements on equipment for HPT. Fang et al. share a Perspective, which highlights the recent advances and future perspectives of multicomponent precipitation-strengthened alloys. The microstructural features and their impacts on the strengthening behavior of multicomponent alloys such as superalloys, high-entropy alloys and steels, are discussed. Computation-aided techniques are suggested to facilitate the advanced alloy design for multicomponent alloys. Liu et al. shed light on the multi-scale characterization of erosion behavior of TA2 titanium alloy welded joints. They show that the heat-affected zone and the base metal of a TA2 titanium alloy welded joint outperform the weld seam in terms of corrosion resistance in seawater. Different flow rates of seawater are shown to have a significant effect on the welding joint area. In the study of Song et al., corrosion resistance of the low-alloy high-strength steel weld metal is analyzed for different alloy compositions under atmospheric and simulated seawater environments. A multicomponent $L1_2$ structured $Ni_{46.5}Co_{24}Fe_8Al_{12.5}Ti_9$ superlattice alloy is investigated on its grain-boundary segregation behavior and superior mechanical properties in the study of Liu et al., to tackle the intrinsic grain-boundary embrittlement and low ductility. Both theoretical calculations and experimental observations show that elimination or reduction of interfacial chemical order is effective to improve the ductility of the superlattice alloy. Dong et al. investigate the microstructural effect on the mechanical properties and corrosion resistance of welded joint of a 620-grade marine steel using mainly electron microscopy. The weld metal shows better corrosion resistance, and better hardness and strength, compared to the heat-affected zone and the base metal. The article by Xie et al. presents a

study on geometric structure of directionally solidified Ni-based master superalloy DZ125 turbine blades. The microstructural evolution with temperature and stress are investigated in detail.

This Research Topic covers various alloys and metals, and various advanced characterization methods that are introduced in these works. It enables a better insight into the composition-microstructure-process-property correlation in structural materials. Apparently, there remains to have plenty of open questions for further developments of advanced structural materials. It is expected that this Research Topic can provide some backgrounds and inspirations towards future research directions in the domain of structural materials.

Author contributions

JZ: Writing–original draft. SG: Writing–review and editing. NC: Writing–review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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