EDITORIAL

Preface to the special issue on advanced preparation of tungsten-related materials and their applications

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Tungsten and related metals, including cobalt, molybdenum, vanadium, as well as their compounds, were an important group of materials to the sustainable development of our society. Since materials hold the key on various devices, much effort has been devoted to designing a large library of advanced tungsten-related metals and compounds to improve the devices performance, including fusion reactors and energy storage and conversion (ESC) devices. Researchers contributed much effort to prepare advanced tungsten-related materials to enhance their inherent properties such as radiation resistance, thermal shock resistance, electric conductivity, and photothermal. Benefiting from these advancements, tungsten-related materials are widely utilized in fusion reactors, batteries, electrocatalysis, photothermal conversion, and other devices.

This special issue focuses on advanced preparation of tungsten-related materials and their various applications, featuring one review paper and seven research papers. The review paper focused on the tungsten-related materials application in battery systems. Hu et al. highlighted the self-support tungsten-related electrodes structure, which greatly eliminated interface resistance and system complexity in batteries. Since tungsten and related elements played significant roles in various devices, such as fusion reactors, the efficient extraction of tungsten from raw minerals such as wolframite and scheelite, was the primary issue. Zhao et al. conducted the fundamental studies of the tungsten and related metals from leaching residues. Han et al. introduced a new “sol-spray drying-calcination-hydrogen thermal reduction”

process to prepare the nano tungsten powder, and then further investigated the densification behavior and kinetic mechanism. The advanced preparation of nano tungsten powder would be possible to produce advanced plasma facing materials in fusion reactors. Liu et al. proposed that the laser fragmentation processed ZrC nanoparticles (the average size of 5.6 nm) greatly enhanced the mechanical properties and thermal shock resistance of tungsten alloys. In the following four research papers, researchers focused on ESC applicants. Sun et al. developed a novel heterostructure of reduced graphene oxide (rGO) and CoNiO₂ nanosheets as an efficient bifunctional electrocatalyst. Zafar et al. proposed an efficient Co₂NiS₄/C electrocatalyst with high stability to effectively facilitate the water oxidation. Moreover, molybdenum-based materials (MoS₂) were designed (Narayanan et al.) via controlling van der Waals (vdW) stacks to enable stable and sensitive electrochemical sensing platforms. The efficient cobalt-based photothermal aerogel, Co₃O₄@PDA-rGO, also achieved high light-to-vapor energy efficiency (Xu et al.), and the excellent practical performance in seawater desalination demonstrated great potential for real-world applications.

We do wish that this issue would provide latest research advances, insightful perspectives, and deep understandings of advanced preparation of tungsten-related materials and their applications. Although the content could not cover all aspects, it is our good hope that this special issue would bring more attention and generate new aspects towards this direction. Finally, we greatly thank the contribution from all the authors, reviewers, and editors for their great effort to make this issue and the prestigious journal *Tungsten* successful.

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