Editorial for rare metals, special issue on *advanced thermoelectric materials*

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As a clean energy technology to combat the global energy dilemma and the environmental problems, thermoelectrics that enable a direct conversion between heat and electricity have attracted increasing attention in recent decades. This solid-state, vibrationless technology has long been used for powering the spacecrafts of several deep-space missions and has limited commercial use in niche market, but these are now actively considered for a variety of new applications, such as the conversion of automobile exhaust heat into electricity. Meanwhile, materials research flourishes with the knowledge that significantly improves the thermoelectric efficiency for even more applications. This motivates *Rare Metals* to have a special issue focusing on thermoelectrics.

This special issue publishes 1 review and 11 research articles focusing on both theoretical and experimental aspects, covering both conventional and novel thermoelectric materials, including both alloys and composites. The articles in this issue are from the research groups from China, USA, Europe, Japan and Korea, the topics of which cover a variety of bulk, nano- and 3D printing techniques for material/device synthesis, both measurement and

calculation for analysis, and both electronic and thermal approaches for improving the thermoelectric performance.

Research on thermoelectrics will continue to be driven by the in-depth physical understandings, the advancement in material synthesis as well as the discovery of new materials. The resulting advancements could definitely be expected to sufficiently improve thermoelectric materials, which could enable improvement in thermoelectric devices from niche applications to the mainstream of energy technologies.

This journal will continue to serve as an excellent platform for rapid publication of high-quality manuscripts in topics related to thermoelectric materials and beyond for a variety of applications. We sincerely hope that the readers will find the articles published in this special issue extremely informative, and enjoy your reading!

Yan-Zhong Pei has been working on advanced thermoelectric semiconductors for more than a decade, from synthesizing the materials to understanding the underlying physics and chemistry. He holds a B.E. from Central South University in China, a Ph.D. from the Shanghai Institute of Ceramics, CAS, and postdoctoral research experience of around 5 years from Michigan State University and the California Institute of Technology.

He became a National 1000Plan junior professor in 2012 at the School of Materials Science and Engineering, Tongji University, Shanghai, China. His interests are focused on materials physics and chemistry for energy applications.

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Xiao-Yuan Zhou is currently a professor at the Department of Applied Physics and is the director of the Analytical and Test Center at Chongqing University. She gained her Ph.D. in Applied Physics from the Hong Kong Polytechnic University in 2008 and was a Postdoctoral Fellow in the University of Washington and University of Michigan till 2013, where she worked on nanostructured materials for energy conversion and storage

application. Currently, her research has been concentrating on synthesizing high-performance functional materials for thermoelectric application and on understanding their underlying physics and chemistry.

Tie-Jun Zhu is the Qishui Distinguished Professor with the school of Materials Science and Engineering at Zhejiang University. He obtained his Ph.D. degree from Zhejiang University in 2001. He was a research fellow in Singapore-MIT Alliance from 2002 to 2004 and a Visiting Scientist in California Institute of Technology in 2011. He has been a faculty member in Zhejiang University since 2004. He won the National Science Fund for

Distinguished Young Scholars in 2017. His current research is on the advanced fabrication, microstructure and transport mechanisms of high-efficiency thermoelectric materials.