Editorial

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(Guest Editors)

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Electrochemical energy storage has attracted great attention from the society with the prevalence of renewable energy resources and electrical vehicles. Particularly, there has been effortless quest for high energy and high power rechargeable lithium-ion batteries (LIB) and high efficiency and economic battery technologies in beyond. In this evolving process, nanoscience and technology have brought revolutionary changes to the battery field, as to the research areas of catalysis, electronics and biological science, etc. This issue collects some of the latest studies on how nanoscience and technology used in the most promising battery chemistries and gives a flavor of such evolutionary transition of the electrified society.

This battery special issue includes 5 topics: (i) Li-ion and Li metal batteries; (ii) high energy conversion Li chemistry, Li-sulfur and Li-O₂ batteries; (iii) Na-ion batteries; (iv) multivalent-ion batteries; and (v) capacitors. There are nine review papers that summarize the recent progress in these topics and provide background knowledge about the various battery systems. The topic (i) includes four research papers on the cathode materials development and six anode related studies for LIBs and Li metal anodes. For high energy Li-based conversion chemistry topic (ii), one paper focuses on the electrode material design for Li-sulfur batteries and two papers present their remarkable progress in improving the cyclability and understanding the

reaction mechanism of Li-O₂ batteries. As a promising alternative to LIB, Na-ion batteries (NIBs) have attracted a lot of research interests. Several papers in topic (iii) have offered strategies to synthesize high energy electrode materials and provided insights on the electrochemical behaviors of NIBs with good performance. Multivalent-ion batteries are another class of high energy systems that show great potential to complement the conventional Li-based energy storage methods. Two studies related to magnesium and zinc-air batteries are included in this topic (iv). At last, one paper focusing on the stability of high power system using Li-ion hybrid capacitor is introduced in topic (v).

Overall, the collection of this issue represents the frontier of high performance battery research. It is with the innovative synthetic approaches of electrode materials, the unraveling understanding of electrochemical phenomenon and the outstanding cell-level performance, one could believe in the promising future of the marriage between nanoscience and battery technology, for which this special issue is steering.

It is an honor to be invited to edit this special issue for *Nano Research*. We would like to thank the following people who made this special issue possible: the Editors-in-Chief Dr. Hongjie Dai and Dr. Yadong Li for their support, the reviewers for improving the quality of the papers and last but not least the authors for their contributions.

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