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Special Topic: Electrochemical Energy Storage

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Preface

Nowadays each country in the world has been facing great challenges of energy, which is especially clear in China due to strong demands from economy development. Fortunately, much work has been successfully done and shown that electrical energy storage may be one of key strategies to deal with these challenges. Electrochemical energy storage is such a huge topic that we cannot use limited space to summarize all big progresses in core scientific disciplines, comment on all aspects of research status, but we try to show representative advances and give possible suggestions for future work. We are lucky to collect some deep insight viewpoints from leading scientists in this field, which are closely related to or based on these authors' own research work on electrochemical energy storage. Some typical rechargeable electrochemical energy storage devices such as lithium-ion batteries and supercapacitors are selected as a focus of this special issue, which are also the hot topics in the community.

Up to date, it is clear to us that the charge storage mechanism in battery systems mainly includes the intercalation, alloying and conversion reactions of solid state electrode materials with secondary species (e.g. H^+, Li^+, Na^+, and K^+), while the charge storage mechanism of supercapacitors mainly originates from electrical double-layered capacitance at electrode/electrolyte interface and those surface Faradaic redox reactions at electrode surface (also called as pseudocapacitance). Compared to battery systems, supercapacitors often have larger power density and longer cycling ability. Towards practical applications of these devices, people are required to increase their energy density and charge discharge rate; therefore, those electrode materials with high electrochemical activity and fast rate of both electron transfer and ion diffusion become more and more important. Much work has been carried out to focus on the design of active electrode materials and the construction of novel electrode structures, with high surface area, short diffusion length, more active sites and high conductivity. Creative studies on the newly developed integrated electrode and *in-situ* formed electrode have shown the big potential to next-generation high-performance energy storage devices. To stimulate more exciting work in this field, we invited some leading scientists from Chinese universities and Chinese Academy of Sciences to briefly discuss recent advances and future directions in electrochemical energy storage.

Science China Technological Sciences (*Sci China Tech Sci*) is a great platform globally for all scientists and technologists to share their basic and innovative research results in the fields of natural sciences and high technologies, focusing on the breakthroughs all over the world. In last few months, we had a great time to jointly work on this special topic with the invited authors, reviewers, and editorial staffs of *Sci China Tech Sci*. We thank all of them for their professional contributions to this special topic. We hope this issue may be useful to those researchers who are now working on electrochemical energy storage or planning to do so.

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