

Developing the new active sites on metal oxides for enhanced electrochemical energy storage and conversion

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Developing electrode materials for renewable energy storage and conversion by electrochemical reactions is highly demanded over the past few decades. High performances of electrochemical energy storage and conversion system has been achieved through recent advances in metal-oxide based materials. Especially, structural properties of metal oxides for the electrode materials are treated as design factors to realize a high reaction rate and a reducing the kinetic imbalances in practical devices. Recently, we found that the electrochemical approach for controlling the structure of metal oxide nanoparticles at few-nano scale level by reducing the oxidation state of metal ions. In this presentation, technique used in battery research will be presented as the new approach for nanostructuring the metal oxides for electrocatalysts and asymmetric hybrid capacitors. Their highly enhanced electro-active surfaces from their various structural advantages can be the key to success in designing the high-performance devices. We hope that the method and applications demonstrated here could offer a opportunity to discuss ideas for designing the new materials.