SPECIAL MATERIALS SEMINAR

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9341 Chemistry

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One Dimensional Nanomaterials for Emerging Energy Storage

One-dimensional nanomaterials can offer large surface area, facile strain relaxation upon cycling and efficient electron transport pathway to achieve high electrochemical performance. Hence, nanowires have attracted increasing interest in energy related fields. We designed the single nanowire electrochemical device for in situ probing the direct relationship between electrical transport, structure, and electrochemical properties of the single nanowire electrode to understand intrinsic reason of capacity fading. As the battery was charged and discharged repeatedly, lithium was progressively incorporated into the electrode, causing it to lose its crystalline structure and weakening its conductivity. Then, we designed the general synthesis of complex nanotubes by gradient electrospinning, including $Li_3V_2(PO_4)_3$, $Na_{0.7}Fe_{0.7}Mn_{0.3}O_2$ and Co_3O_4 mesoporous nanotubes, which exhibit ultrastable electrochemical performance when used in lithium-ion batteries, sodium-ion batteries and supercapacitors, respectively. Besides, we identified the exciting electrochemical properties (including high electric conductivity, small volume change and self-preserving effect) and superior sodium storage performance of alkaline earth metal vanadates through preparing CaV_4O_9 nanowires. We also constructed a new-type carbon coated $K_{0.7}Fe_{0.5}Mn_{0.5}O_2$ interconnected nanowires with interesting potassium storage performance through a simply electrospinning method. Our work presented here can inspire new thought in constructing novel one-dimensional structures and accelerate the development of energy storage applications.