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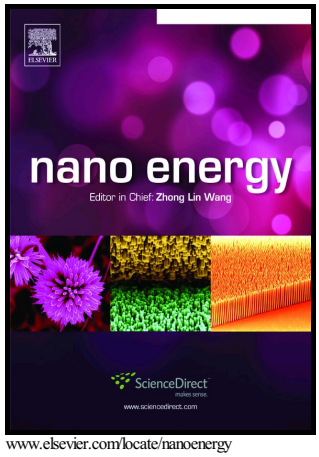

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Enhancing Li-ion battery anode performances via disorder/order engineering

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Abstract:

The performance of the anode materials is critical to further development of Li-ion batteries. However, the cycling stability and safety performance of anode materials are still far from satisfying. Here we propose a new strategy, i.e., the disorder/order engineering, by which the anode performance of the Li-ion battery can be improved. First, the disordered materials were prepared by vitrifying V_2O_5-TeO_2 (VT) liquids, and then the VT glass powder was mixed with acetylene black and binder to form anode for a lithium ion battery. Second, by subjecting the battery to discharging/charging cycles, the VT glass was partially transformed into ordered phases at the nanoscale, i.e., the disorder-order transition occurred. Even the first cycle of discharging/charging induced the disorder-order transition. The ordered nano-domains and the disordered matrix exert a synergetic effect to facilitate the ionic and electronic transport and to maintain structure stable against discharging/charging. As a consequence, both the capacity and the cycling stability were greatly enhanced, and the structural origin of such enhancement was explored. This study has opened a new way for developing high performance anodes for Li-ion batteries.

Keywords: Li-ion battery; Anode; Disorder/Order engineering; Nanocrystals

[1] These authors contributed equally to this work.