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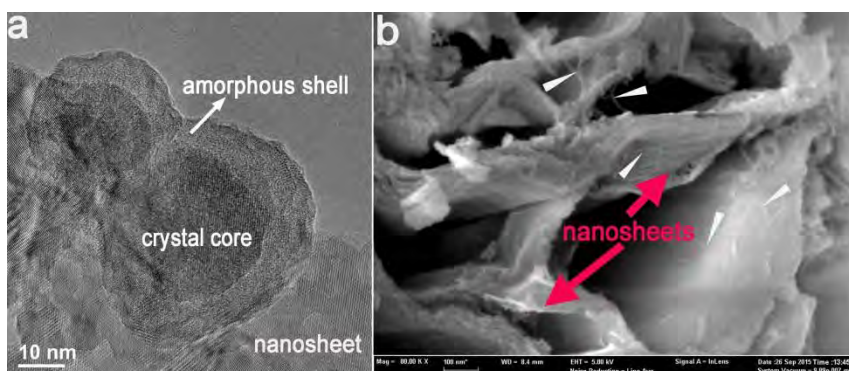
Chemically Modified Hierarchical Metal Oxide Nanostructures for Excellent Lithium Storage

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The overall performance of lithium-ion batteries (LIBs) is highly dependent on the inherent electrochemical properties of the electrode materials.^{1,2} Specifically, three-dimensional complex hierarchical architectures assembled by low-dimensional nano-sized building blocks usually possess enhanced LIB performance.^{3,4} Herein, by employing post chemical modification, we obtain novel hierarchical metal oxide nanostructures: crystalline@amorphous core/shell Co_3O_4 nanoparticles decorated ultrathin Co_3O_4 nanosheets; NiO nanowires decorated NiO nanosheets. The concentration of oxygen vacancies can be well controlled in the nanostructures, which is of importance because the conductivity can be tuned accordingly. The lithium storage properties of the chemically-modified hierarchical electrodes are found to be strongly correlated with oxygen vacancy concentration. It is believed that the excellent electrochemical performance can be attributed to the unique designed hierarchical nanostructures. The presented facile synthesis route can be applied to other metal oxides with desirable nanostructures, which provides a novel way to optimize their functions.



(a) Crystalline@amorphous core/shell Co_3O_4 nanoparticles decorated ultrathin Co_3O_4 nanosheets, (b) NiO nanowires (the white arrows) decorated NiO nanosheets

1. Goodenough, J. B. *et al.* A perspective on electrical energy storage. *MRS Commun.* **4**, 135 (2014).
2. Goriparti, S. *et al.* Review on recent progress of nanostructured anode materials for Li-ion batteries. *J. Power Sources* **257**, 421 (2014).
3. Sun, Y.-K. *et al.* Nanostructured high-energy cathode materials for advanced lithium batteries. *Nat. Mater.* **11**, 942 (2012).
4. Magasinski, A. *et al.* High-performance lithium-ion anodes using a hierarchical bottom-up approach. *Nat. Mater.* **9**, 353 (2010).