One-pot synthesis of bicrystalline titanium dioxide spheres with a coreshell structure as anode materials for lithium and sodium ion batteries

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Abstract Summary: A novel bicrystalline titanium dioxide hierarchical sphere has been successfully synthesized via a facile one-pot solvothermal method. The hierarchical sphere has a core-shell structure with TiO_2(B) nanosheets sheathing the anatase titanium dioxide sphere core.

Introduction: Currently, environmental disruption and economic recession of burning non-renewable and unsustainable fossil fuels have gained a great deal of awareness of renewable energy storages [1]. TiO_2 with various crystalline polymorphs has been extensively studied in LIBs, and recent reports show the properties as Na hosts [2]. As characterized by X-ray diffraction, scanning electron microscopy (SEM), and high-resolution transmission microscopy (HRTEM), the material shows a core-shell structure with TiO_2(B) nanosheets sheathing the anatase titanium dioxide sphere core and optimized electrochemical performance. It exhibits high initial discharge capacity (114.8 mAh g^{-1}) with almost no capacity fading after 100 cycles and still maintains at 91.7 mAh g^{-1} after 375 cycles at a super-high current density of 5040 mA g^{-1} (30 C). It also shows excellent rate capability in sodium ion batteries at various current densities ranging from 85 to 850 mA g^{-1}. The unique hierarchical structure with excellent cycle performance and rate capability of this compound, make a compelling case for its development as an anode material for both lithium and sodium ion batteries.

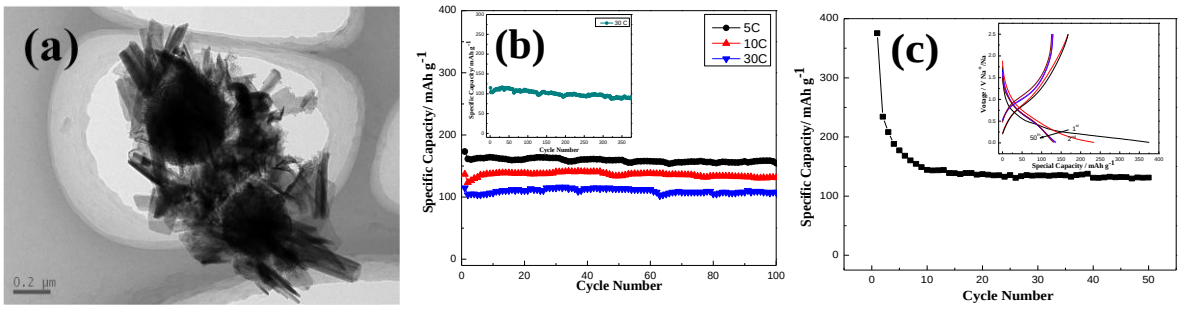

Fig. 1. (a) TEM images of anatase@TiO_2(B) bicrystalline hierarchical spheres and (b, c) its cycling performance at different current density in the range of 1.0 V-3.0 V in Li half-cells and Na half-cells, respectively.

References

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