Carbon/Cr₂O₃ nanocrystal Composites as an Anode with Improved Lithium Storage Performance

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Carbon-coated Cr₂O₃ composites were prepared by the hydrothermal reaction of ammonium chromate ((NH₄)₂CrO₄) and sucrose to form a polymer that was then annealed and carbonized at 600°C under an argon atmosphere to generate nanoparticles of the anodic nanocomposites. The results of electrochemical test showed that the nanocomposite with 49.0 wt% carbon content has more stable and excellent electrochemical performance as the anode material for lithium-ion batteries. The diameters of the Cr₂O₃ crystals in the nanocomposites were 20-50 nm, which helped to modulate the volume expansion of Cr₂O₃ crystals beneath the external carbon shell and ultimately greatly improved the lithium storage performance and discharge/charge (i.e. lithiation/delithiation) cycling stability of the nanocomposites. The specific capacity of the nanocomposite with carbon content of 49.0 wt% was 542 mAh·g⁻¹ after 300 cycles, which was significantly higher than the capacity of the bare Cr₂O₃ crystals. In addition, as the cycle number increased, the specific capacity of the battery also steadily increased. These results indicated that the composite material is a promising candidate as an anode material for lithium-ion batteries.

Keywords: Carbon-coated; Lithium storage performance; Lithium-ion batteries;

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