

High-Energy Density W-doped Ni-rich Cathodes for Next-generation Li-ion Battery

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The Li[Ni_{0.8}Co_{0.15}Al_{0.05}]O₂, (NCA) cathode has become the wide used cathode of choice because it provides high discharge capacity with long cycle life. To further improve the capacity of current NCA cathodes, the content of Ni in the NCA cathode has been progressively increased; however, this solution is limited by the deterioration of capacity and safety¹⁻³. Here, we report the electrochemical performance of the W-doped Li [Ni_{0.95}Co_{0.04}Al_{0.01}]O₂ cathode (W-NCA95) by substituting of W. The microstructure of having orientation and long aspect-ratio primary particles W-NCA95 delivers a high initial capacity of 242 mAh g⁻¹ (0.1 C) and retains 77.4% of its initial capacity after 1000 cycles, compared to that of 14.5% for NCA95. The outstanding cycling performance of the W-NCA95 cathode is attributed to the reduction of the anisotropic volume change and the unique elongated primary particle morphology combined with strong crystallographic texture⁴. The proposed W-NCA95 cathode opens ways to provide high capacity, superior cycling stability, and improved thermal stability for Ni-rich layered cathodes.