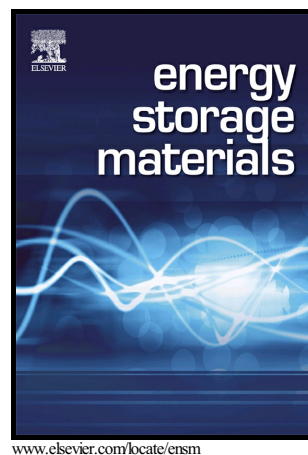


NaVPO₄F with High Cycling Stability as a Promising Cathode for Sodium-ion Battery

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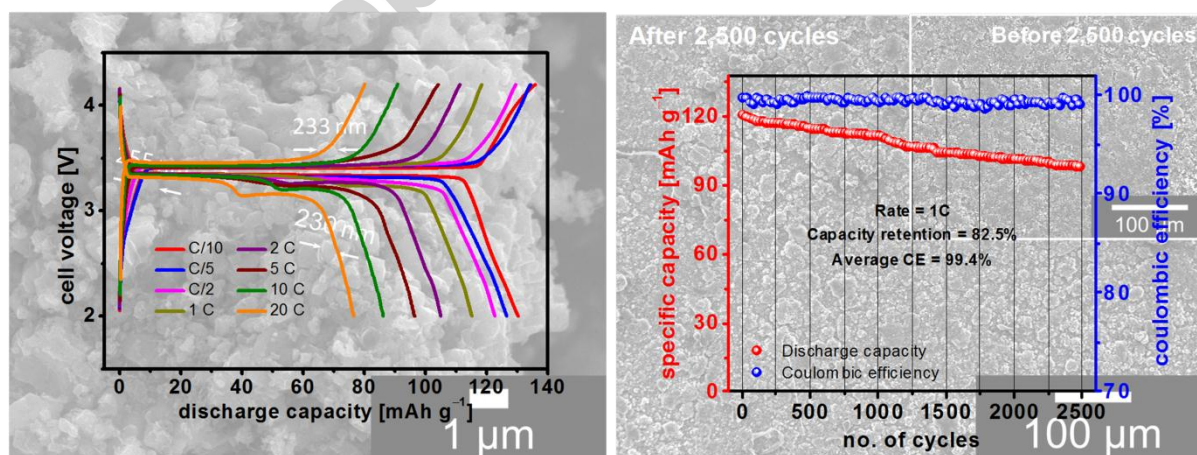
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Abstract

In this article, we report a high-performing fluorophosphate-based cathode material for sodium-ion battery, namely NaVPO₄F, synthesised by a facile one-step soft template method. We compared physical and electrochemical properties between the NaVPO₄F materials synthesised using V₂O₃ and V₂O₅ as starting precursors. FESEM images show that the samples consist of particles of size in the range 200-800 nm. The synthesised NaVPO₄F using V₂O₅ cycled vs. sodium metal at 0.1 C is able to deliver a high discharge capacity of 133 mAh g⁻¹, with a flat discharge plateau at 3.33 V. At a moderate current rate of 1 C, it still manages to achieve a reversible discharge capacity of 121 mAh g⁻¹, and retains 82% of its initial capacity after 2,500 cycles. Notably, this electrode material exhibits impressive long-term cyclability at high rates, where it is able to retain 81 and 77 % of respective initial discharge capacities even after 10,000 cycles at 10 and 20 C. This durable performance of NaVPO₄F using V₂O₅ precursor is attributed to the good electrode surface integrity owing to negligible volume changes as confirmed by FESEM experiment.

Graphical Abstract



Keywords: Sodium-ion battery; fluorophosphate; vanadium precursor; long-term cycling; high-rate performance.

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