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Partially Glassy Na_{0.74}CoO₂/Graphite Composite Cathode for Enhancing Electrochemical Performances of Sodium-Ion Batteries

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The Na_{0.74}CoO₂/graphite composites with sodium-vacancy and amorphous phase were derived from the precursors Na₂CO₃ and Co-ZIF-4 by solid reaction approach. Co-ZIF-4 is the zeolitic imidazolate framework [Co(Im)₂], where Co is tetrahedrally coordinated to 4 imidazole rings. The amorphous phase (likely CoO) was found to not only play the role of electrode protective layer, but also possess electrochemical activity, which enhances the capacity of the battery system. These findings were explained by performing the experiments such as charge/discharge test, X-ray diffraction, high-resolution transmission electron microscopy, electron diffraction, energy dispersive X-ray spectroscopy, mapping and X-ray photoelectron spectroscopy. The composites exhibit a long service life, a discharge capacity of 35 mAh g⁻¹ at 10 C and 74% capacity retention after 500 cycles. The excellent electrochemical performances are attributed to a synergistic effect of sodium-vacancy, amorphous phase and porous structure.

Keywords: Na_{0.74}CoO₂ Composite; Na-ion Battery; Cathode, Amorphous Phase; Na-Vacancy

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