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Metal organic frameworks derived cobalt sulfide/reduced graphene oxide composites with fast reaction kinetic and excellent structural stability for sodium storage

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ABSTRACT:

We report a metal-organic framework-derived Co₉S₈ nanoflakes on reduced graphene oxide sheet composites as an advanced sodium-ion battery anode. Using a galvanostatic intermittent titration technique, we reveal that the sodium diffusion coefficient of the composite is higher than that of its counterpart. *Ex-situ* scanning electron microscopy images suggest the excellent mechanical stability of Co₉S₈ nanoflakes on the reduced graphene oxide sheet electrode during cycling, thereby facilitating cyclic stability. The partial surface-induced capacitive effect also contributes to electrochemical performance. With the reduced graphene oxide, the Co₉S₈ nanoflakes on the reduced graphene oxide sheet electrode deliver a high discharge capacity of 551 mA h g⁻¹ at 0.1 A g⁻¹, a good rate capability at 10 A g⁻¹, and an excellent cyclic stability up to 500 cycles. rGO/Co₉S₈ shows potential for practical applications in Na₃V₂(PO₄)₃/rGO/Co₉S₈ full cells.

Keywords: Transition metal sulfides; Metal organic frameworks; Sodium ion battery; Long-term stability; Ion diffusion coefficients

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