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Toward high-performance all-solid-state supercapacitors using facilely fabricated graphite nanosheet-supported $CoMoS_4$ as electrode material

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Abstract

Hybrids of graphite nanosheet-supported $CoMoS_4$ (GN-$CoMoS_4$) were synthesized through a hydrothermal method. The $CoMoS_4$ nanoparticles are uniformly distributed on the graphite nanosheets, leading to large specific surface area and good electrical conductivity. The GN-$CoMoS_4$ hybrids were systematically studied for electrode materials of supercapacitors. Due to the amorphous characteristic of $CoMoS_4$, which can supply more transportation channels for ion diffusion, together with the large specific surface area and excellent conductivity of GN, the as-prepared hybrid electrode material exhibited a high specific capacitance of 774 F g^{-1} at the current density of 1 A g^{-1} and an excellent cyclic stability (94.49% of its initial specific capacitance retained after 6000 cycles at a current density of 8 A g^{-1}). An all-solid-state asymmetric supercapacitor was fabricated using GN-$CoMoS_4$ as positive electrode and porous active carbon (AC) as negative electrode, which exhibited a highest energy density of 42.85 W h kg^{-1} at 900 W kg^{-1} and excellent cycling stability (93.2% retention after 8000 cycles). The results demonstrate that the GN-$CoMoS_4$ hybrids are promising candidate for the electrode materials in high-performance supercapacitors because of the well-designed microstructure.