Amorphous V-doped Co3S4 yolk-shell hollow spheres derived from metal-organic framework for high-performance asymmetric supercapacitors

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Abstract:

Metal-organic frameworks (MOFs) have appeared as a new option for constructing various functional materials for energy storage applications. In this work, a novel amorphous vanadium doped Co3S4 (V-CS) hollow sphere is synthesized through a facile method. Due to the unique structure, the amorphous V doped Co3S4 provides large amount of active sites for better storage energy. A remarkable specific capacitance of 1725 F g−1 at the current density of 0.3 A g−1 was achieved for this electrode. Further, the as-fabricated asymmetric supercapacitor device contains the V-CS electrode and activated carbon electrode (positive and negative, respectively) lead to outstanding performance with maximum energy and power densities of 88.29 Wh kg−1 and 486 W kg−1, respectively, that is better than traditional supercapacitors. In addition, the fabrication process illustrated in this article is facile, controllable, and economical, offering a viable method for fabricating the next generation of high-performance energy storage devices.

Keywords: Metal-organic framework, Metal sulfide, Hollow spheres, V-Doped Co3S4, Amorphous phase