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Molybdenum disulfide nanosheets embedded in hollow nitrogen-doped carbon spheres for efficient lithium/sodium storage with enhanced electrochemical kinetics

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ABSTRACT

Molybdenum disulfide nanosheets@hollow nitrogen-doped carbon (MoS_2@NC) spheres were prepared via a facile synthesis and investigated as a host material for ion storages. When used in lithium ion batteries (LIBs) or sodium ion batteries (SIBs), the MoS_2@NC spheres electrodes exhibited excellent electrochemical performances. A high capacity of 1386 mAh g^{-1} after 100 cycles was obtained at a current density of 200 mA g^{-1} for LIBs. As for SIBs, a capacity of 330 mAh g^{-1} was retained after 400 cycles at 1000 mA g^{-1}. The remarkable ion storage performances can be attributed to the hierarchical architecture of the MoS_2@NC spheres, which not only supply abundant active sites and efficient electron and ion pathways, but also alleviate the volume change of the active MoS_2 material. Meanwhile, synergistic effect of the heterogeneous components, interfacial ion storages, nitrogen doping and induced defects are responsible for high capacities of the MoS_2@NC electrodes. And the electrodes exhibited enhanced electrochemical kinetics due to the significantly improved electrical conductivity and the large specific area of the MoS_2@NC spheres.

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