New Synthesis of Polycrystalline NiSe Nanoarrays on Ni Foam as the Electrode for High Performance Supercapacitors

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The novel aloe leaf-like polycrystalline NiSe nanoarrays grown on the nickel foam are synthesized by one-step hydrothermal method with adding lauramidopropyl betaine (LAB) as the surfactant. The prepared NiSe nanoarrays are characterized by XRD, EDS and FE-SEM. As the electrode for the supercapacitor, the as-prepared NiSe@Ni electrode exhibits high electrochemical performance with an areal specific capacitance of 1.55 F cm^{-2} at the current density of 4 mA cm^{-2} and the capacitance retains 67% of the initial capacitance value after 1000 cycles. Moreover, the asymmetric supercapacitor (ASC) of NiSe//AC (active carbon) is also fabricated by using the NiSe nanoarrays as positive electrode and the active carbon as negative electrode and 1 M KOH solution as the electrolyte. The operating voltage of NiSe//AC ASC can be increased to 1.6 V, at the same time the ASC possesses high energy density (2.67 mWh cm^{-3} at the power density of 46.2 mW cm^{-3}) and retains 72.7 % of initial capacitance after 1600 cycles at current density of 20 mA cm^{-2} .

Keywords: NiSe; aloe leaf-like; nanoarrays; asymmetric supercapacitor

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