Facile Synthesis of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ Nanowire Arrays Grown on Ni Foam for High Performance Supercapacitor

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Here, a novel $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire arrays grown on Ni foam was successfully synthesized by one-step hydrothermal method. At the same time, the diameter of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire grown on Ni foam was easily controlled by the reaction times. Furthermore, the electrochemical properties of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire arrays grown on Ni foam were analyzed and compared by the cyclic voltammetry, galvanostatic charge-discharge and electrochemical impedance spectroscopy. It was found that the capacitive properties of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire arrays grown on Ni foam were related to the diameter of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire. The composite foam containing $\text{Ni}_3\text{S}_2@\text{MoS}_2$ nanowire with diameter of ca. 320.0 nm showed high rate capability of 10.8 F cm^{-2} at 5.0 mA cm^{-2} and good cycle stability with capacitance retention of 83.0% after 1000 cycles. The capability was obviously higher comparing to others Ni_3S_2 grown on Ni foam reported in previous works. These results implied that the design of $\text{Ni}_3\text{S}_2@\text{MoS}_2$ grown on Ni foam without polymer binder was an ideal candidate for supercapacitor applications.

Keywords: $\text{Ni}_3\text{S}_2@\text{MoS}_2$, Ni foam, Nanowires, hydrothermal method, Supercapacitor.

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