Facile preparation of reduced graphene oxide/copper sulfide composite as electrode materials for supercapacitors with high energy density

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Abstract

Recently, copper sulfide (CuS) quite arouses researchers' interest due to its high theoretical capacity and excellent electroconductivity. However, poor cycling stability seriously limited the application in supercapacitors. In addition to the improvement of cycling performance, it is also a challenge to develop electrode materials with energy density. Herein, RGO/CuS composite is prepared successfully by solvothermal reaction methods. By the observation using FESEM and TEM, CuS microstructure displays regular and tiny nanoparticles, which are supported by RGO sheets. After the electrochemical measurements, RGO/CuS composite exhibits a maximum specific capacitance of 946 $F \cdot g^{-1}$ at 10 $mV \cdot s^{-1}$ and 906 $F \cdot g^{-1}$ at 1 $A \cdot g^{-1}$, respectively. The excellent cycling stability is also achieved and it maintains 89% retention after 5000 cycles at 5 $A \cdot g^{-1}$. RGO/CuS composite also possesses high energy density of 105.6 $Wh \cdot kg^{-1}$ at the power density of 2.5 $kW \cdot kg^{-1}$, which indicates that RGO/CuS composite has a bright future as electrode materials for supercapacitors.

Keywords: Regular polygon CuS nanoparticles, Supercapacitor, Cycle stability, Energy density