



## Electrochemical properties of ternary rGO/CuS/PANI nanocomposite for supercapacitor electrodes

**MebrahtuMelakeMezgebe,**

*Donghua University, Shanghai 201620, People's Republic of China*

**Abstract:** Although the metal-like electronic conductivity and high theoretical capacity of copper sulfide (CuS) makes it a promising material in supercapacitors, its poor cycling stability due to volume change during charge-discharge processes is a great challenge. To overcome this challenge, a novel 3D ternary nanocomposite of graphene-CuS-polyaniline (rGO/CuS/PANI) was designed and fabricated via in-situ hydrothermal polymerization methods. The structure and performances of the rGO/CuS/PANI-based electrode was characterized by powder X-ray diffraction, x-ray photoelectron spectra, scanning electron microscope, high-resolution transmission electron microscopy and Fourier transform infrared spectroscopy. Compared to the pristine CuS and rGO/CuS-based electrodes the rGO/CuS/PANI-based electrode showed better electrochemical properties that enhanced its capacitance. Specific capacitances of CuS, rGO/CuS and rGO/CuS/PANI-based electrodes are 93, 155, and 282.5 Fg<sup>-1</sup>, respectively, at a current density of 1 Ag<sup>-1</sup>. Moreover, cycling stability of the target electrode was also improved greatly with a retention ratio of 86 % after 1000 cycles. Such capacitance and cycling enhancements are due to the synergetic effects between the flower-like hollow structures of CuS and the excellent conductivities of rGO and PANI.



**Biography:** MebrahtuMelakeMezgebe is a PhD candidate in the State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering at Donghua University, Email: [413005@mail.dhu.edu.cn](mailto:413005@mail.dhu.edu.cn)

### Publications :

1. Huang KJ, Zhang JZ, Liu Y, Liu YM (2015) Synthesis of reduced graphene oxide wrapped-copper sulfide hollow spheres as electrode material for supercapacitor. International journal of hydrogen energy 40(32):10158-10167.
2. Xu WC, Liang YQ, Su YG, Zhu SL, Cui ZD, Yang XJ, Inoue A, Wei Q, Liang CY (2015) Synthesis and properties of morphology controllable copper sulphide nanosheets for supercapacitor application. Electrochimica acta 211:891-899
3. Mezgebe MM, Ju A, Wei G, Macharia DK, Guang S, Xu H (2019) Structure based optical properties and catalytic activities of hydrothermally prepared CuS nanostructures. Nanotechnology 30(10).
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5. Mezgebe MM, Xu K, Wei G, Guang S, Xu H (2019) Polyaniline wrapped manganese dioxide nanorods: Facile synthesis and as an electrode material for supercapacitors with remarkable electrochemical properties. Journal of alloys and compounds 794:634-644.

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