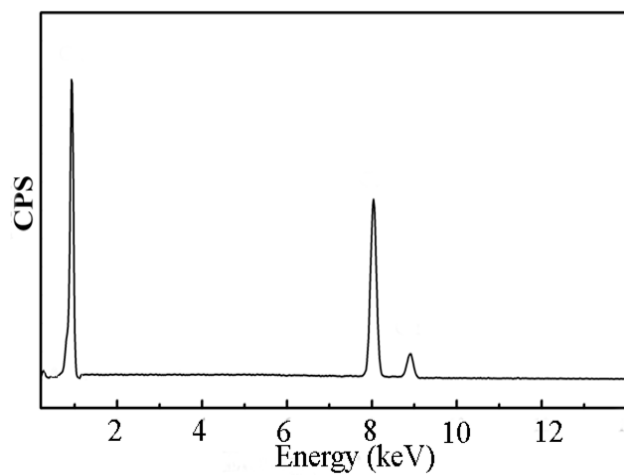
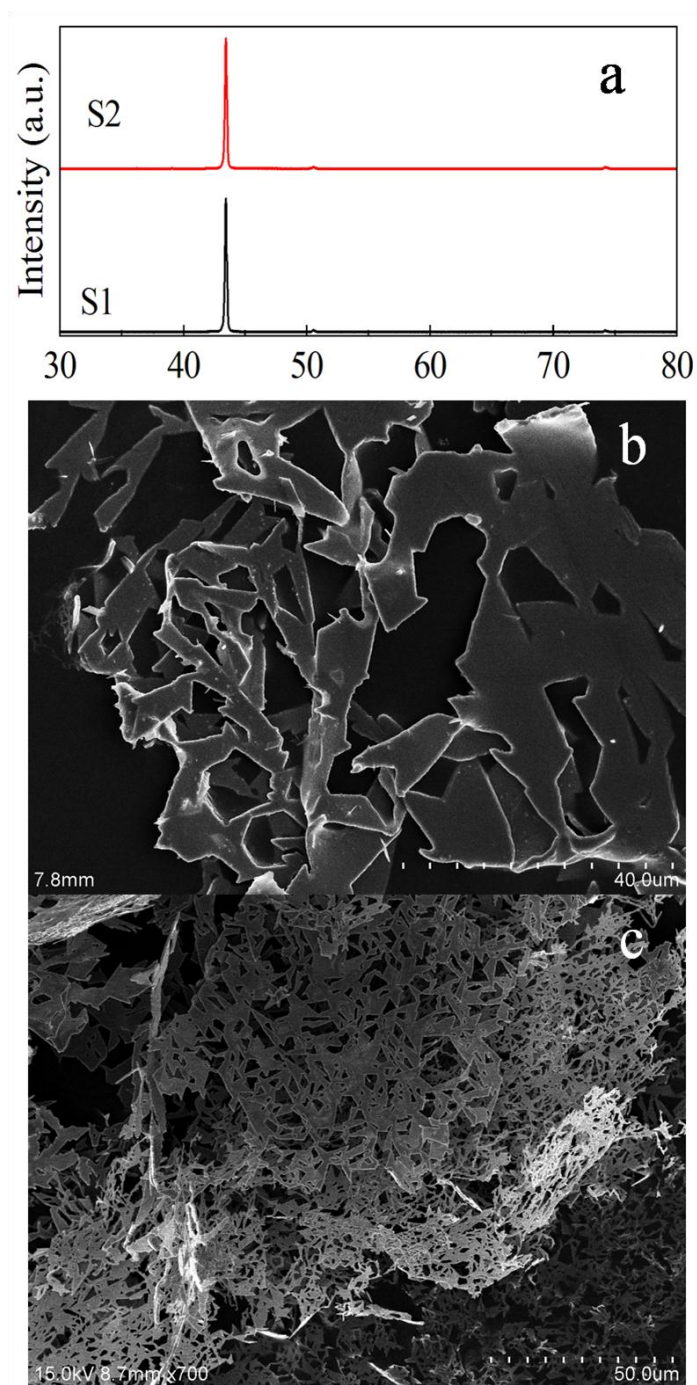


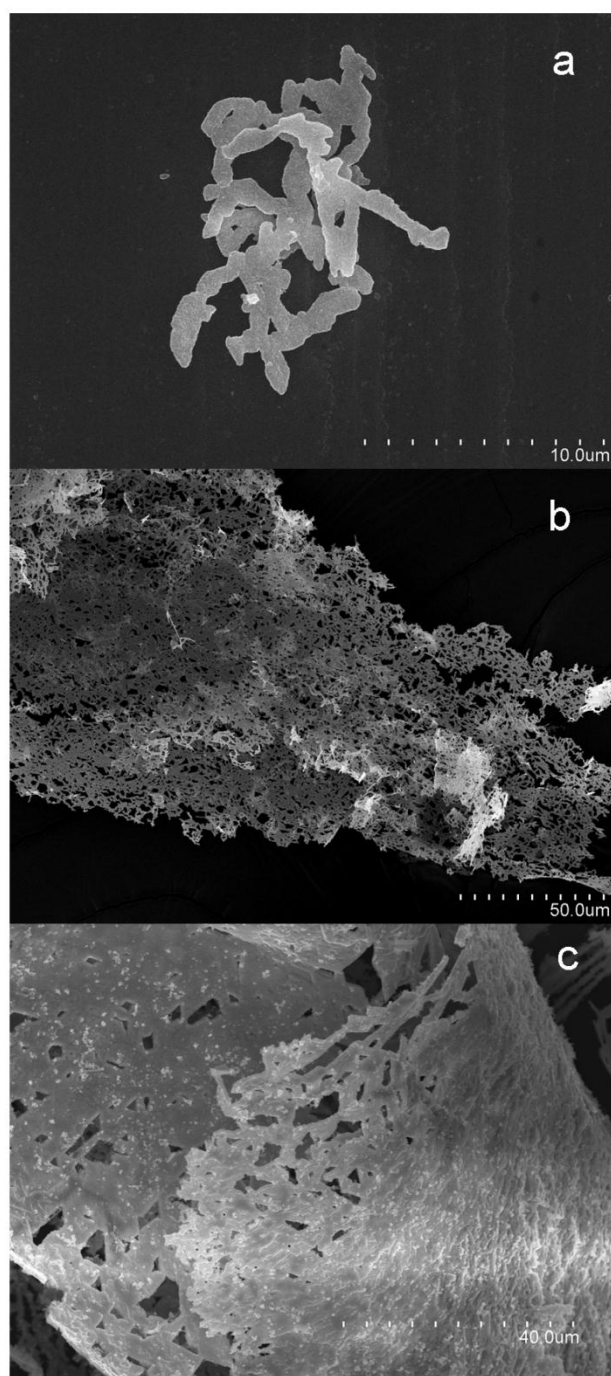
Electronic Supplementary Information (ESI)



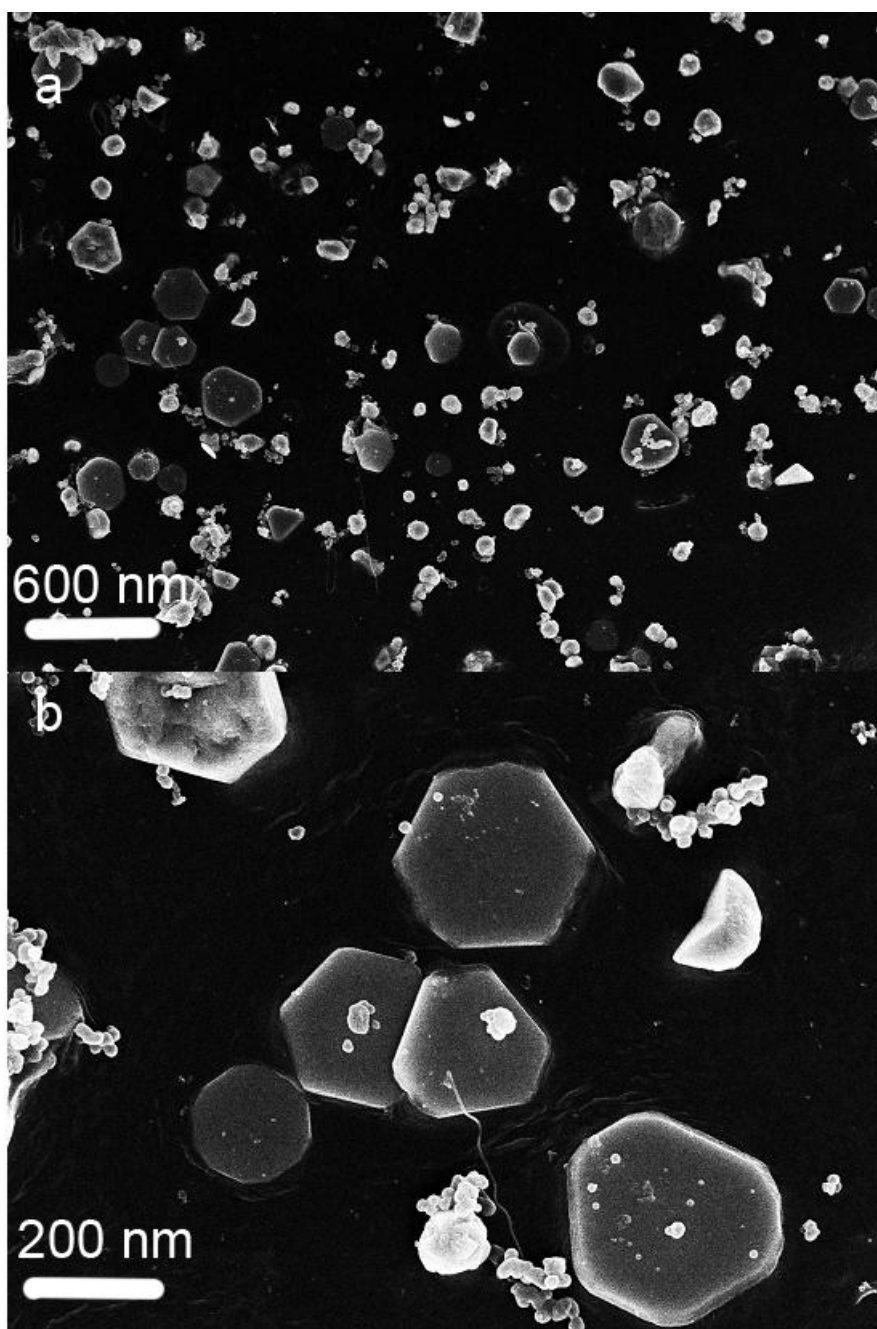
ESI Fig. 1 Energy dispersive x-ray spectrum of Cu superstructures (the product obtained using natural sapless leaves from magnolia grandiflora linn tree).



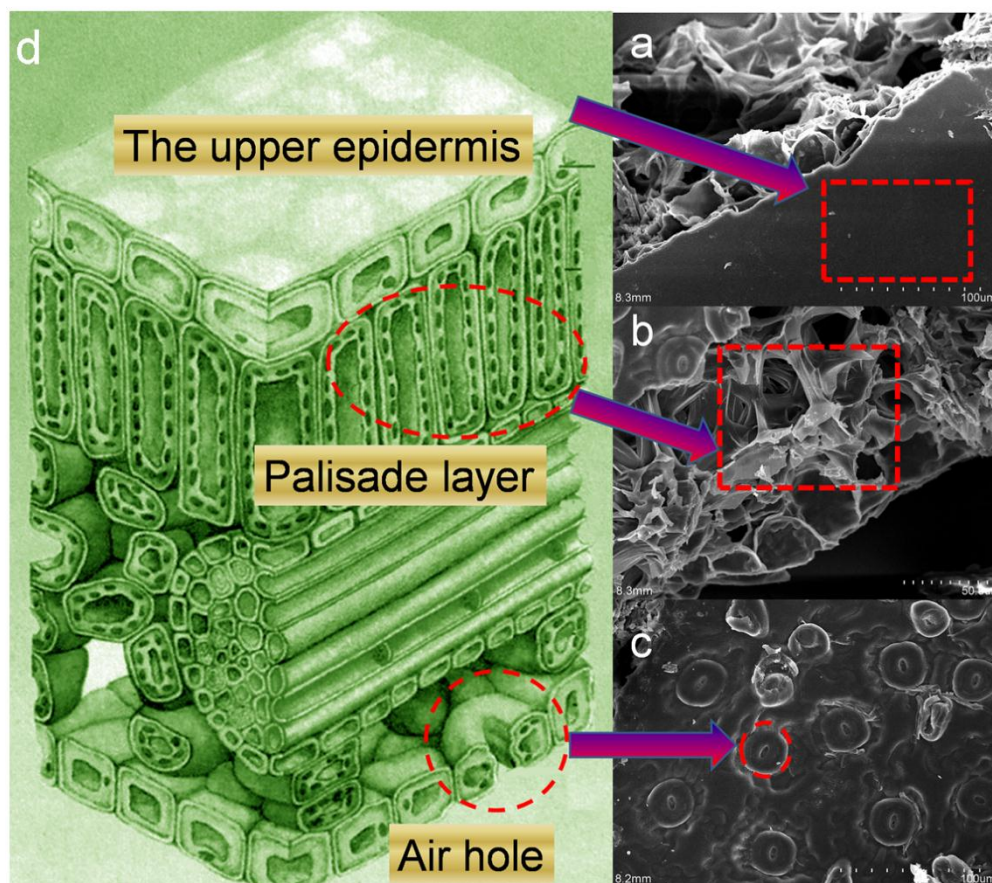
ESI Fig. 2 (a) XRD patterns of samples prepared by sapless leaves-S1 (phoenix tree) and S2 (maidenhair tree); (b) SEM image of S1; (c) SEM image of S2.



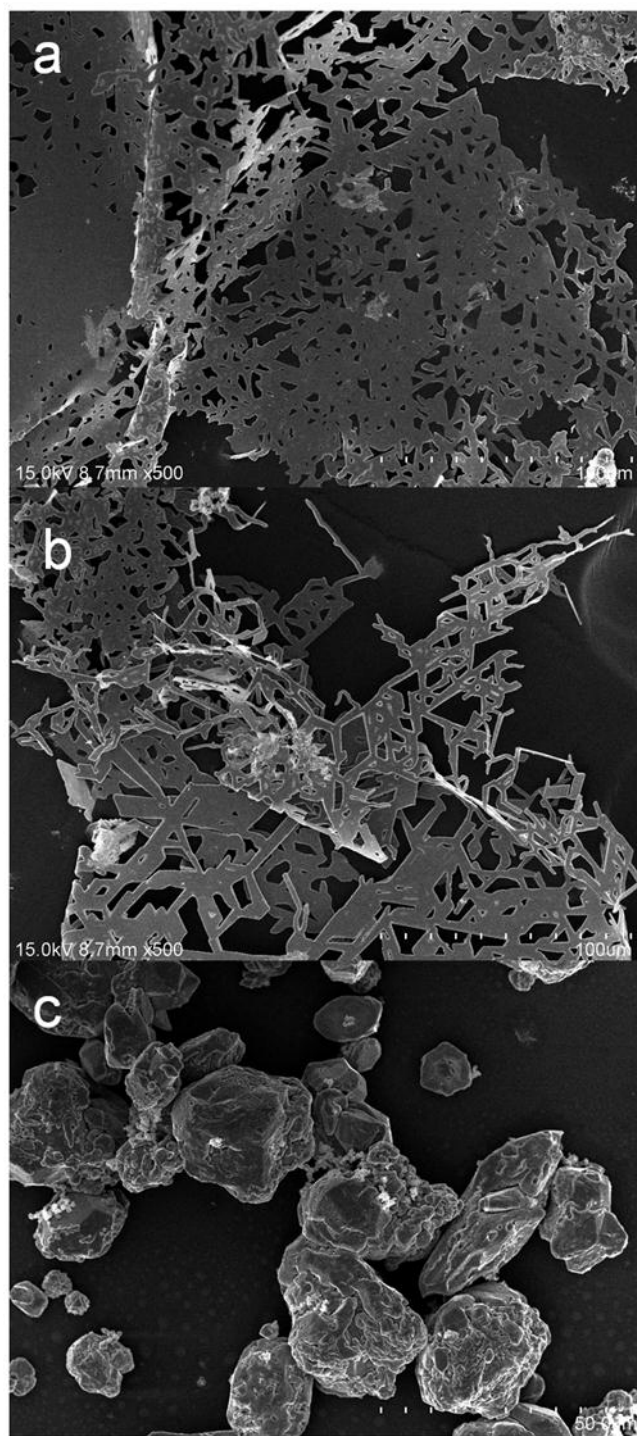
ESI Fig. 3 SEM images of the product obtained: 0.05 g natural sapless leaves (from *magnolia grandiflora* linn tree) and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (0.20 g) were mixed with 20 mL deionized water, maintained at 200 °C for different times: (a) 8 hours; (b) 24 hours; (c) 48 hours.



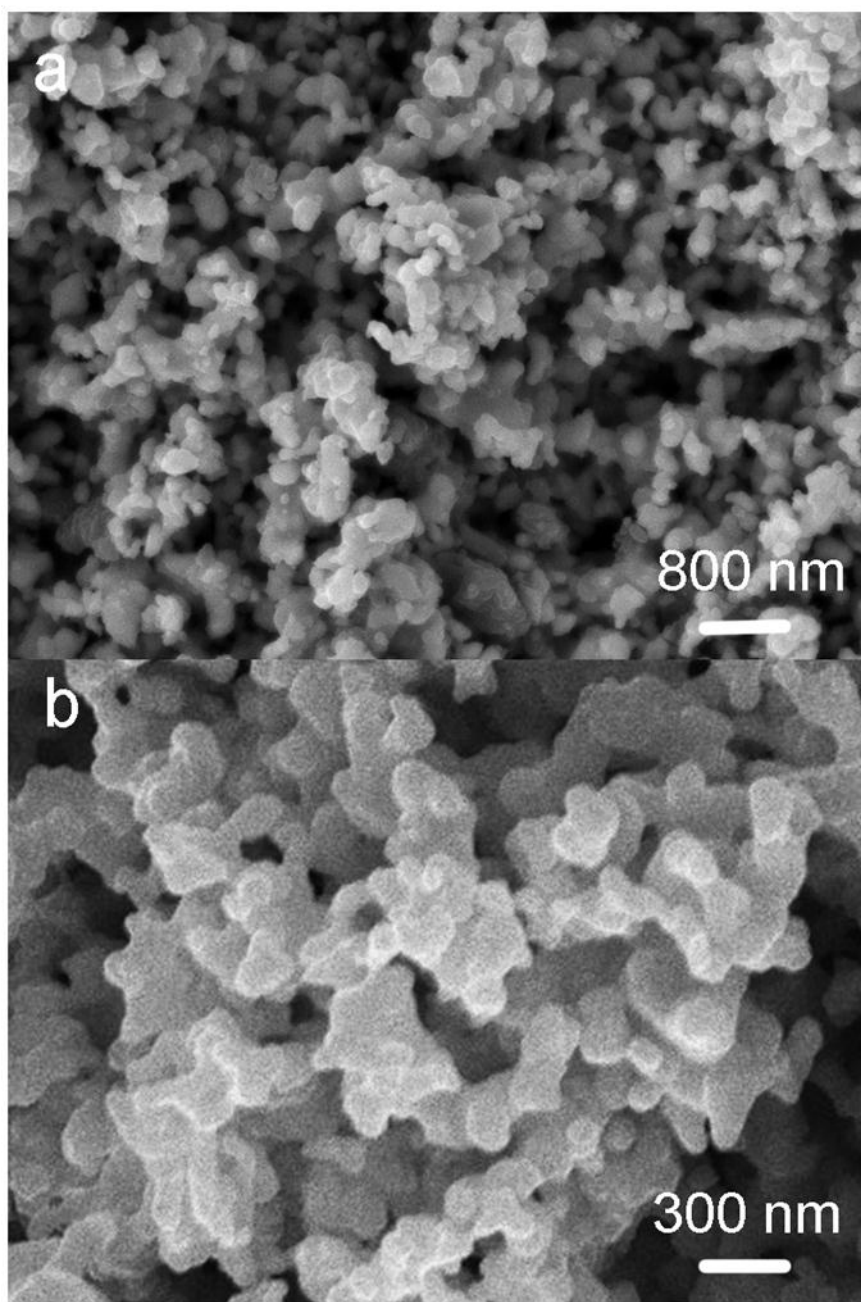
ESI Fig. 4 SEM images of the surface of leaves obtained: 0.05 g natural sapless leaves (from *magnolia grandiflora* linn tree) and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (0.20 g) were mixed with 20 mL deionized water, maintained at 200 °C for 8 hours.



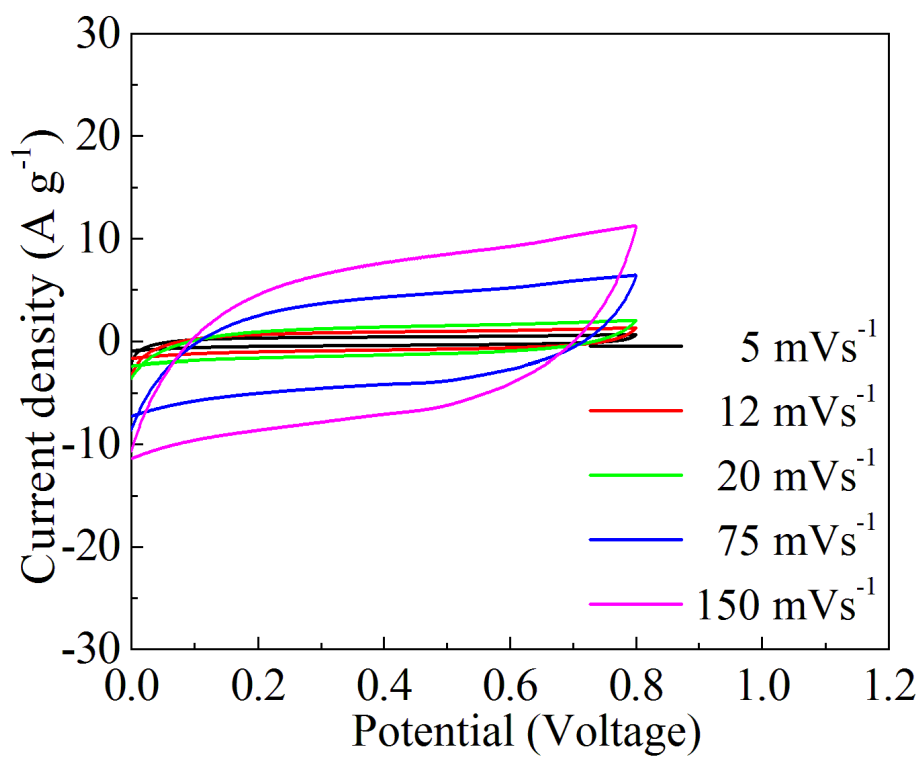
ESI Fig. 5 SEM images of natural sapless leaves from *magnolia grandiflora* linn tree:
(a) The upper epidermis; (b) palisade layer; (c) air hole; (d) a simple scheme of leaves
in microscale.



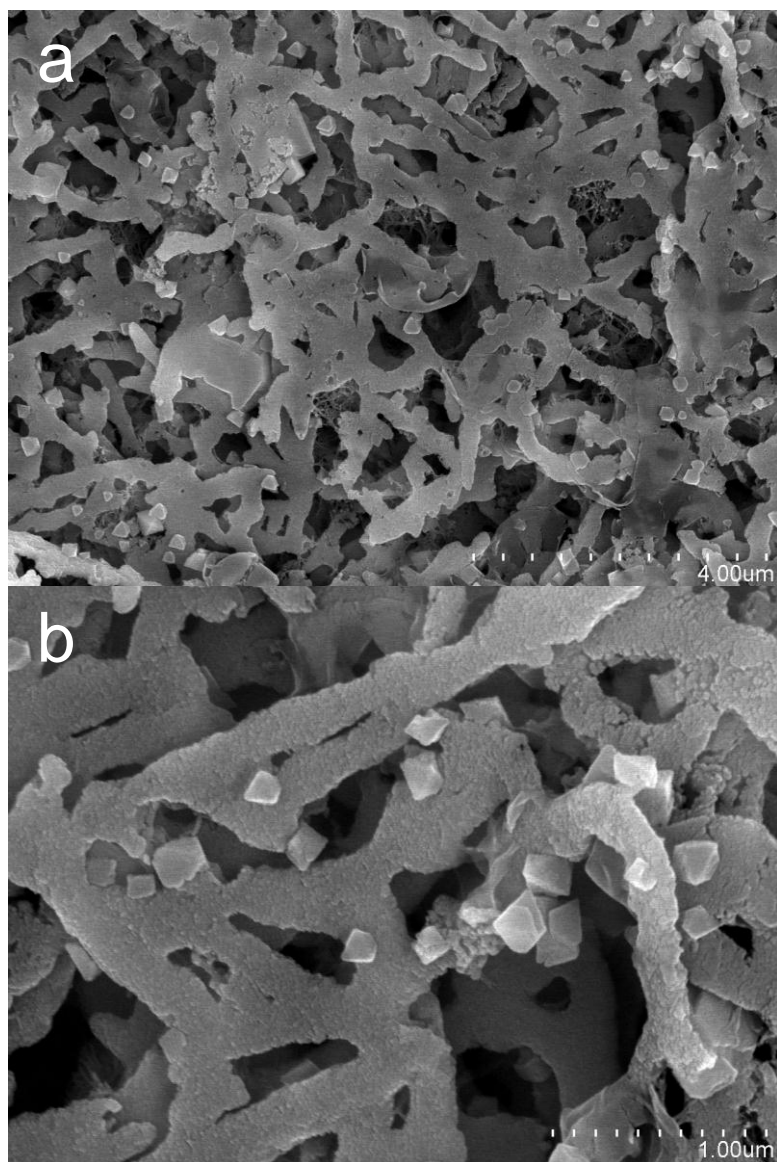
ESI Fig. 6 SEM images of the product obtained by utilization of the surplus leaves for different cycles (from 2 to 4 recycle) (a) The 2nd cycle; (b) The 3rd cycle; (d) The 4th cycle.



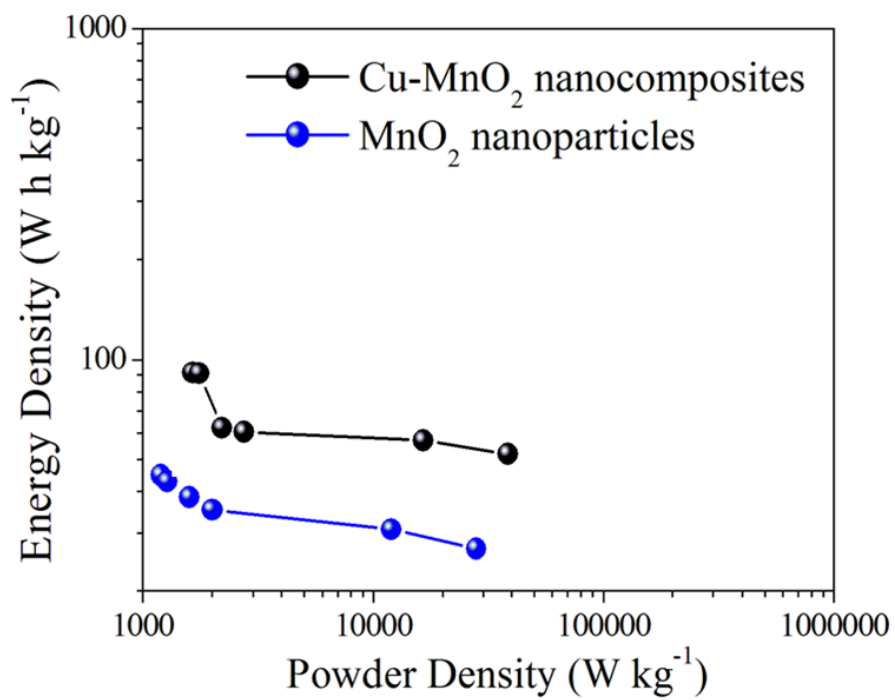
ESI Fig. 7 SEM images of MnO₂ particles.



ESI Fig. 8 Cyclic voltammograms of MnO₂ nanoparticles electrodes at different scan rates.

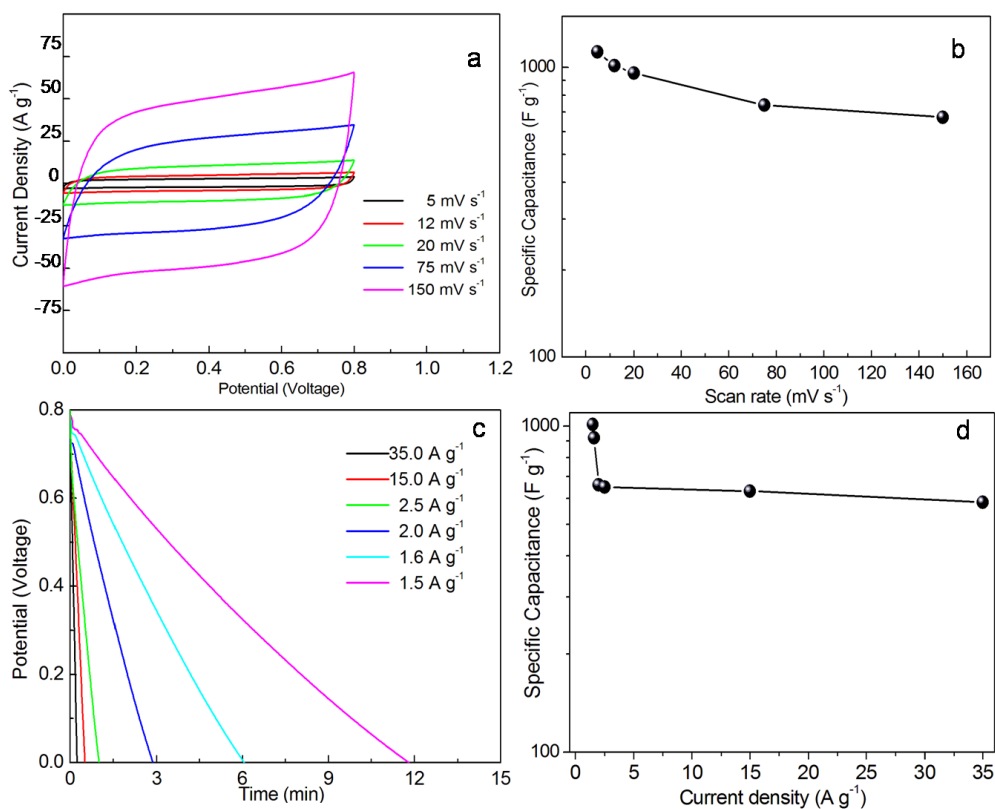


ESI Fig. 9 SEM images of Cu-MnO₂ composites after 2000 cycles.

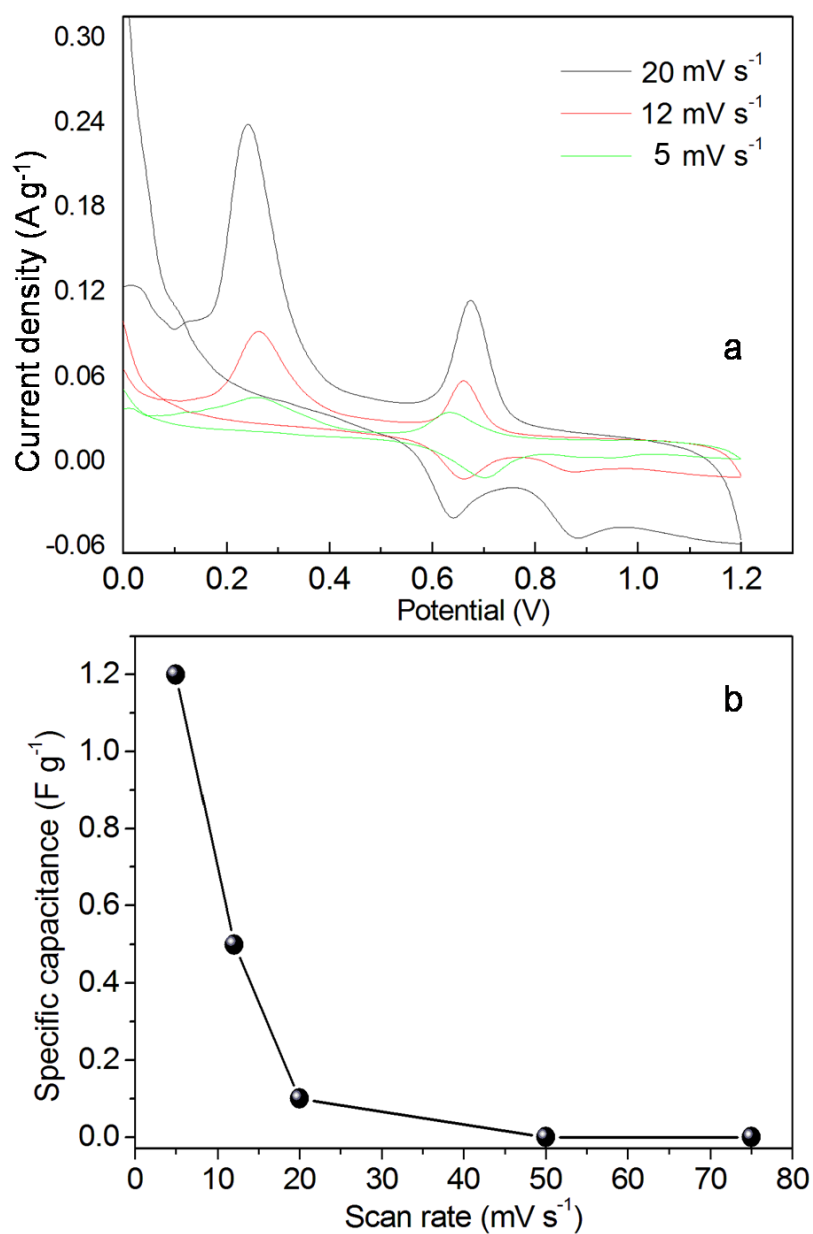


ESI Fig. 10 Ragone plot of estimated specific energy and specific power at various charge/discharge rates.

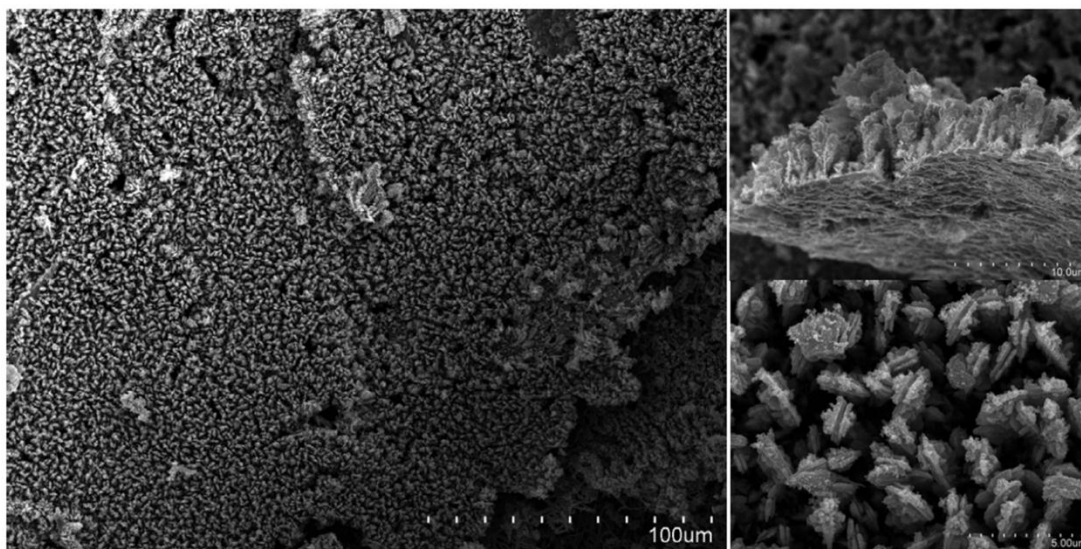
The working electrode was made from mixing of Cu-MnO₂ composite superstructures and PTFE (polytetrafluoroethylene) with a weight ratio of 95:5, coating on a piece of foamed nickel foam of about 1 cm², and pressing it to be a thin foil at a pressure of 5.0 MPa. The weight of active sample is about 5 mg.



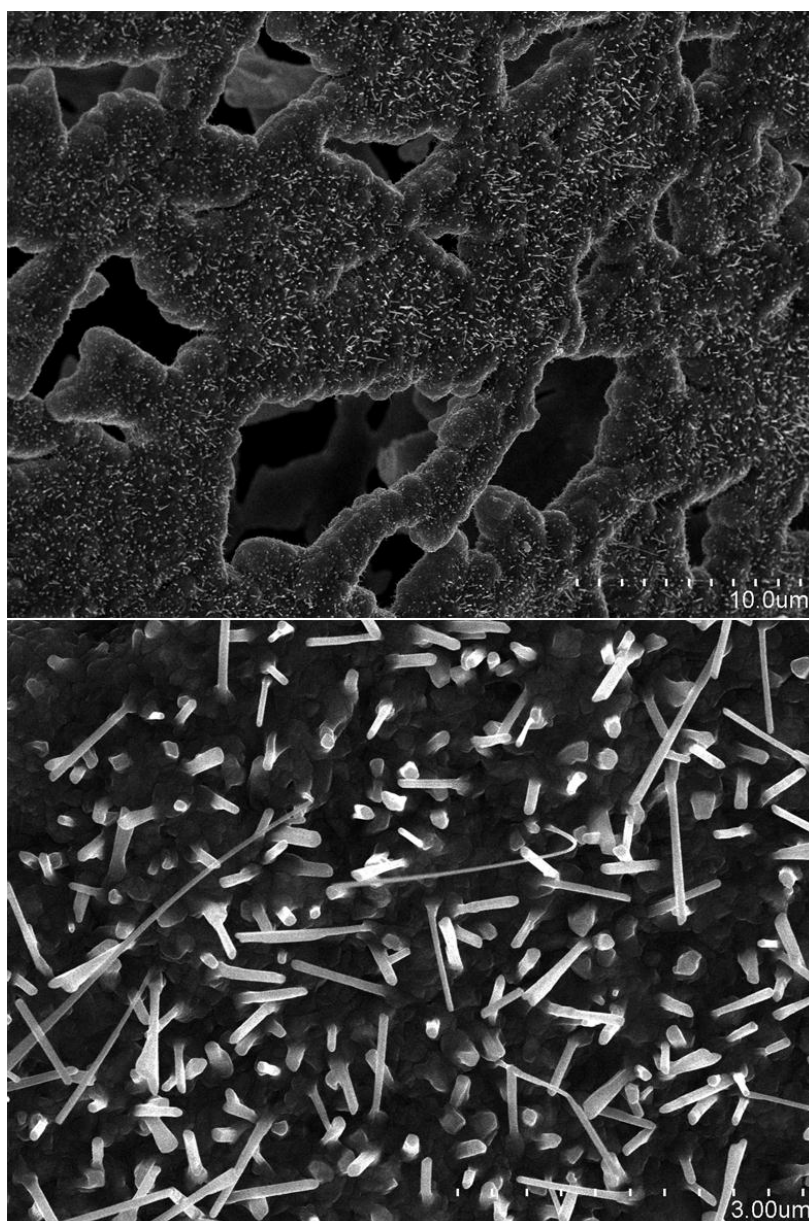
ESI Fig. 11 (a) Cyclic voltammetry (CV) curves from 0.0 to 0.80 V range at different scan rates from 5 to 150 mV s⁻¹ for the Cu-MnO₂ composite superstructures electrodes (*without any acetylene black*) in 1.0 M Na₂SO₄ electrolyte under room temperature; (b) Specific capacitances derived from CV tests in a; (c) The galvanostatic discharge profiles of the Cu-MnO₂ composite superstructures at 1.5, 1.6, 2.0, 2.5, 15.0 and 35.0 A g⁻¹ current density in 1.0 M Na₂SO₄ electrolyte under room temperature; (d) Specific capacitances derived from the discharge curves in c.



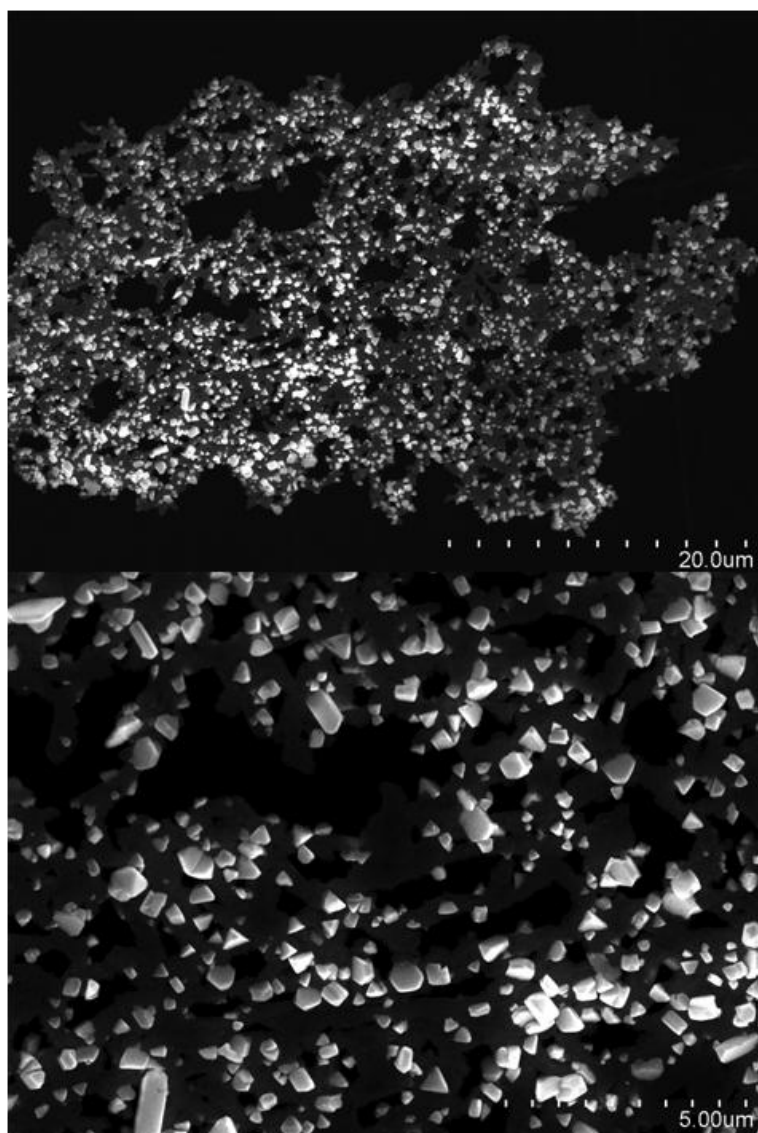
ESI Fig. 12 (a) Cyclic voltammetry (CV) curves from 0.0 to 0.80 V range at different scan rates 5, 12 and 20 mV s⁻¹ for Cu superstructures electrodes (*without any acetylene black*) in 1.0 M Na₂SO₄ electrolyte under room temperature; (b) Specific capacitances derived from CV tests in a.



ESI Fig. 13 SEM images of Cu_2S nanoflowers arrays on Cu superstructures



ESI Fig. 14 SEM images of CuO nanorods arrays on Cu superstructures



ESI Fig. 15 SEM images of CuI nanopolyhedrons on Cu superstructures.