Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supplimentery Information

TOPO mediated rapid hydrothermal synthesis and study of electrochemical performance of nano-structured copper oxide thin films

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[1] Scanning Electron Microscopy(SEM):

Fig. S1 for SEM image of CuO-3 electrode prepared by hydrothermal methode with 0.3M $CuSO_4$ concentration at 90°C for 5min. It observed compactly arrenged nanoflakes at X15,000 magnification. On the other side TOPO assisted CuOT3 sample has nanopetals on yarn-ball likestructure. The nano petals are grown after insertion of capping agent (TOPO).

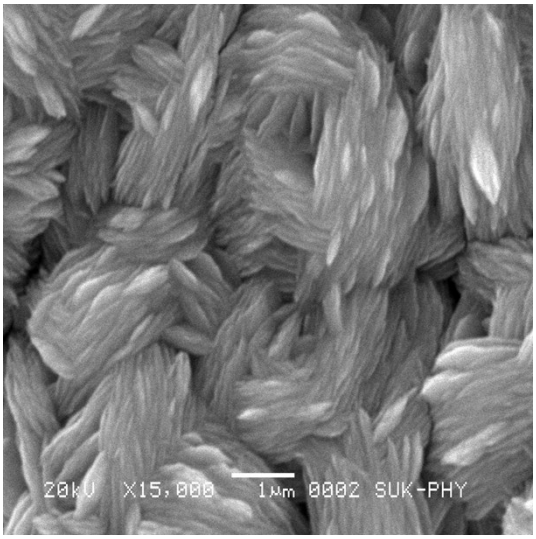

Fig. S1 Scannig electron microscopy of bare CuO-3 at X15,000

2] Electrochemical measurements:

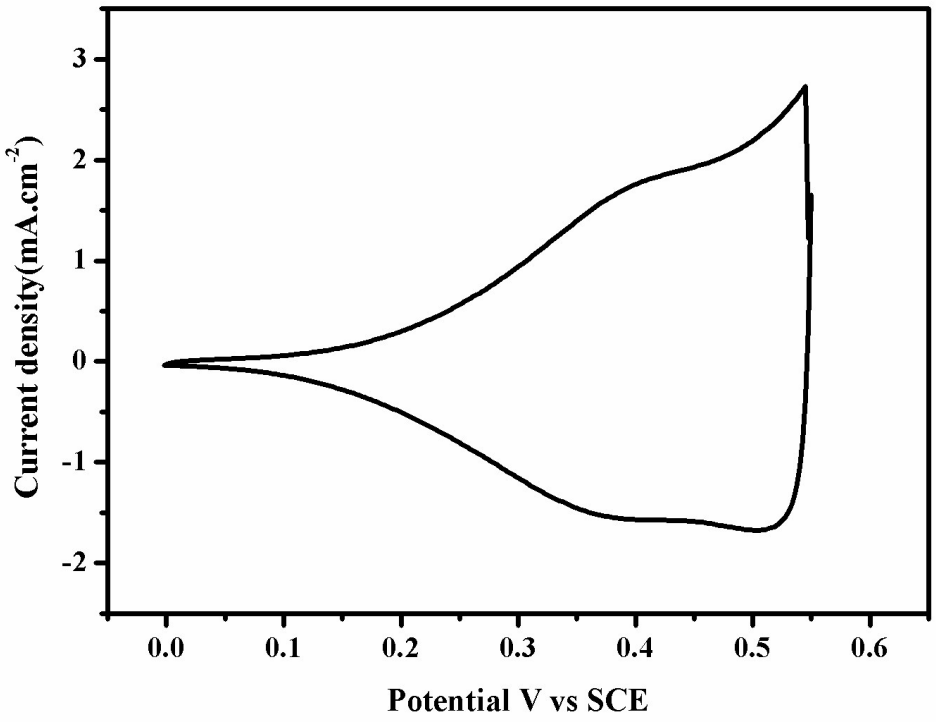

Fig. S2(a): Cyclic voltammogram (CV) of bare CuO-3 at 10mVs^{-1} in 1M aq. KOH

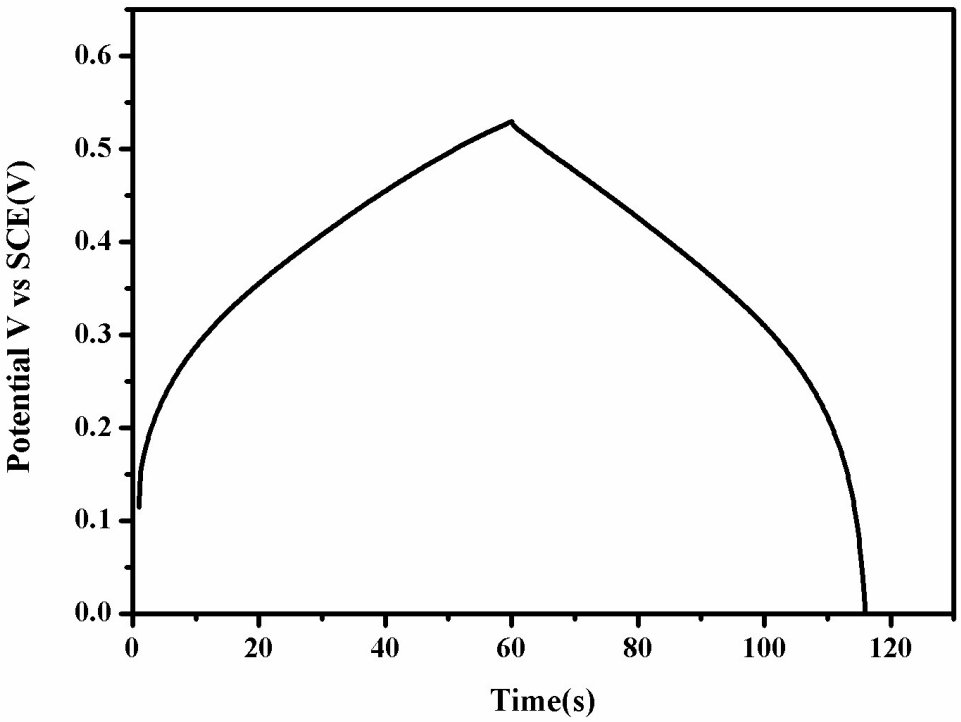

Fig. S2(b): Galvanostatic charge discharge curves of CuO-3 at 1mAcm^{-2} current density in 1M aq. KOH

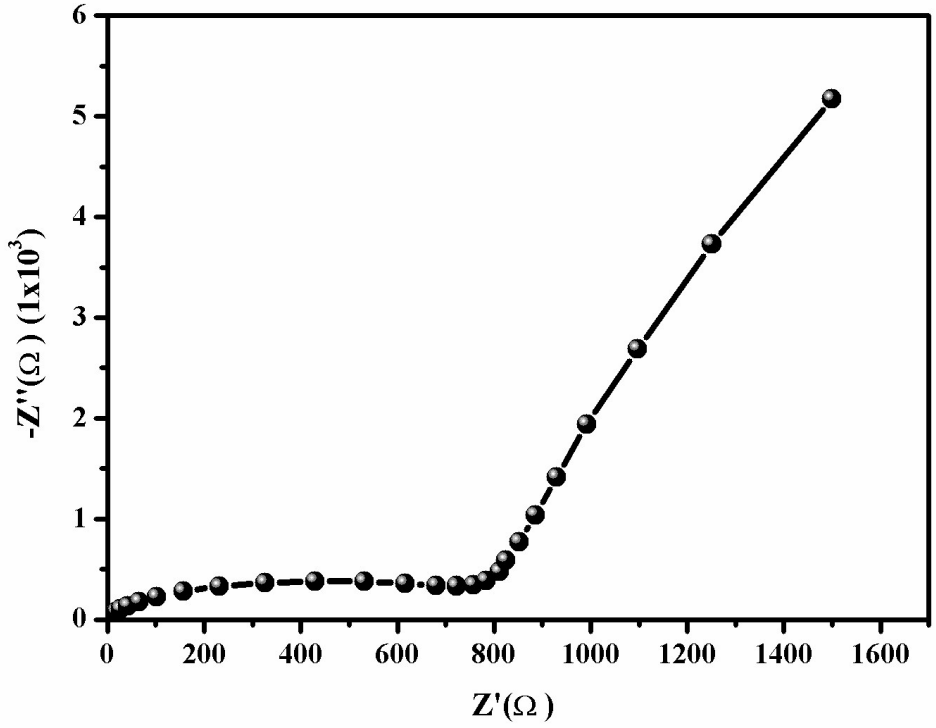

Fig.S2(c) Nyquist plot for sample CuO-3 in 1M aq. KOH electrolyte

Fig. S2(a) observed cyclic voltammogram nature of bare CuO-3 sample. A specific capacitance about 51 Fg^{-1} was achieved in 1M aq. KOH for 10mVs^{-1} which far less than CuOT-3 sample. The compactly arranged nanoflakes reduceses the active surface reponsible for charge storage. Capping agent TOPO alters the surface morphology of the material and observed high specific capacitance.

Charge-discharge curve of bare CuO-3 mention in Fig. S2(b) at 1$mA.cm^{-2}$ within 0 to +0.53V vs SCE in1M aq. KOH electrolyte. This charge-discharge curve is nearly triangular nature with I-R drop about 3.7Ω. TOPO assisted CuO electrode didn't recognised any I-R drop, because of their surface modification due to insertion of TOPO.

Fig. S2(c) shows Nyquiest plot of bare CuO-3 sample at open circuit potential in 1M aq.KOH. Frequency varies from 100KHz to0.01Hz and observed series resistance (R_s)=

0.58Ω and charge transfer resistance() =717.7Ω, which very higher than CuOT-3 sample. TOPO assisted CuO electrdes have low series (R_s) and charge transfer resistance (R_{ct}) comapair to bare CuO-3 sample.

Bare CuO-3 sample has compactly arraged nanopetals which reduces active surface area, due to its compact nature there is high charge transfer resistance (R_{ct}) and I-R drop. These all resistances reduces the performances of bare CuO electrode.