Supporting information

Anodic fabrication of nanostructured Cu_xS and $CuNiS_x$ thin films and their hydrogen evolution activities in acidic electrolytes

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Figure S1

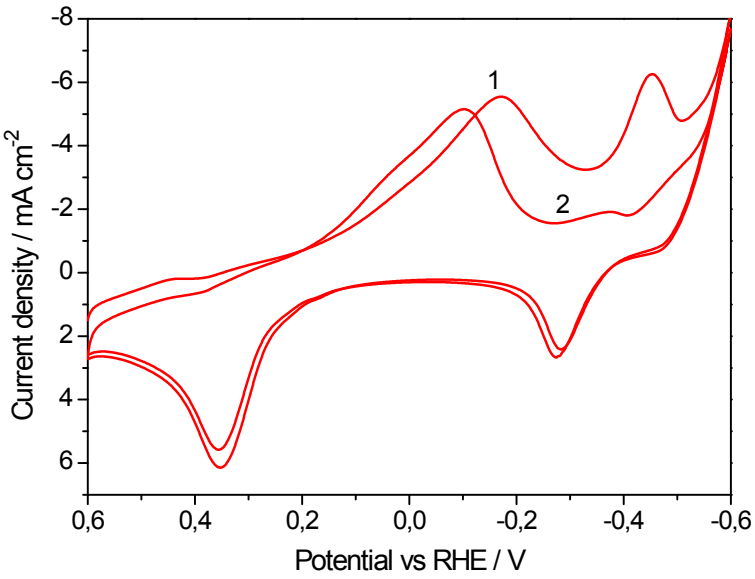


Figure S1 : Repeated cyclic voltammograms of CuxS in 0.5 M Na_2SO_4. 1 – Represent the first cycle, 2 indicates the lower reduction current density for the second cathodic peak.

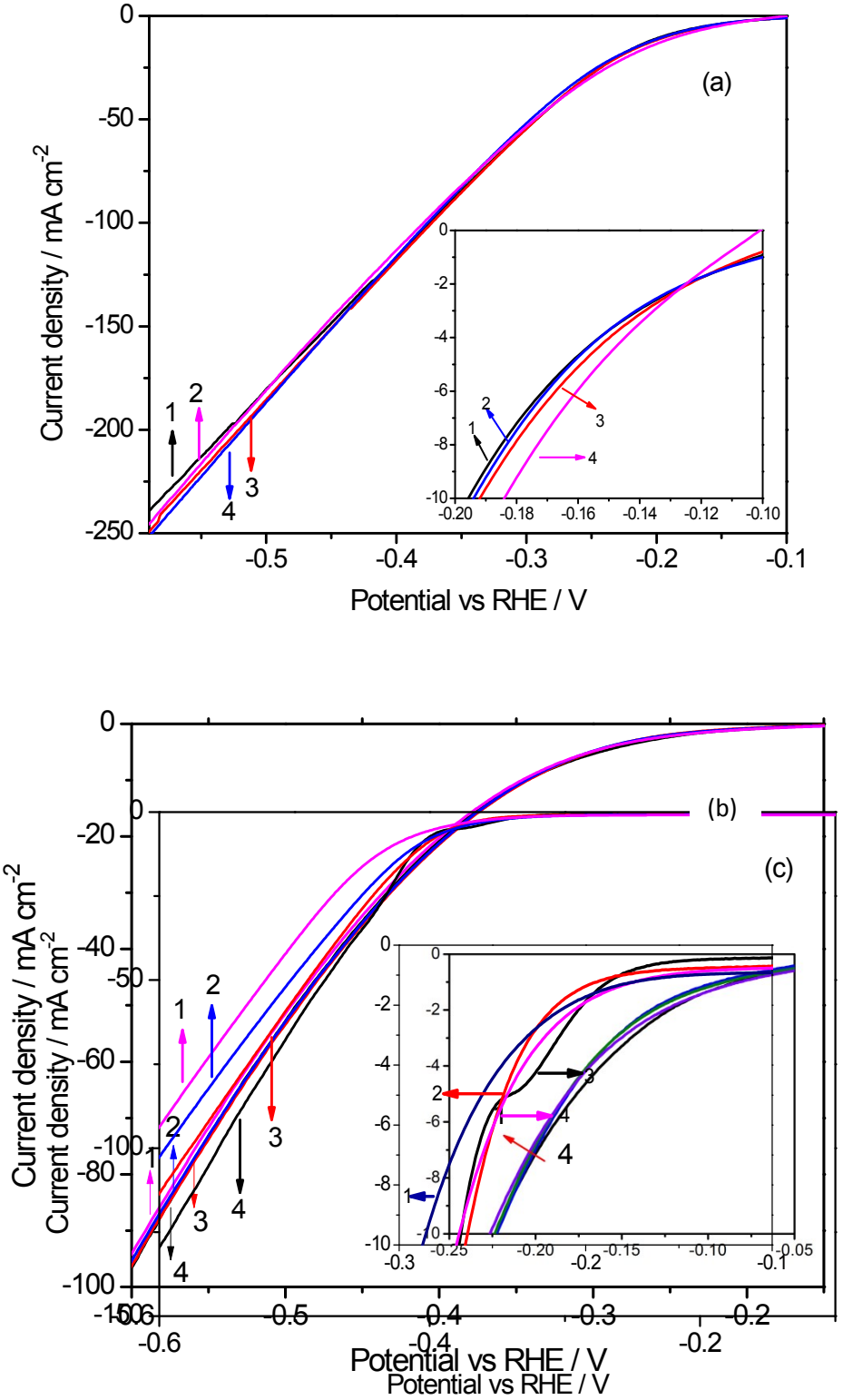
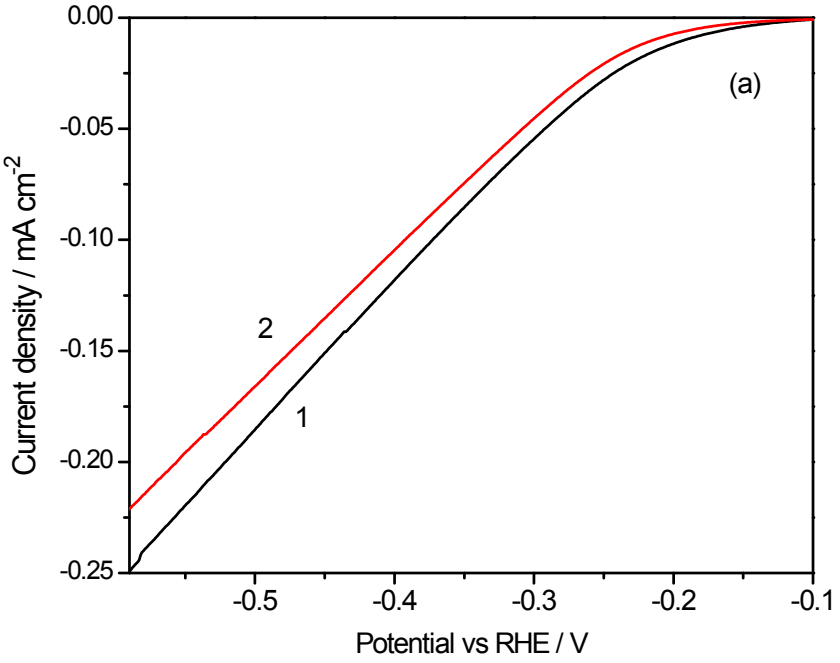
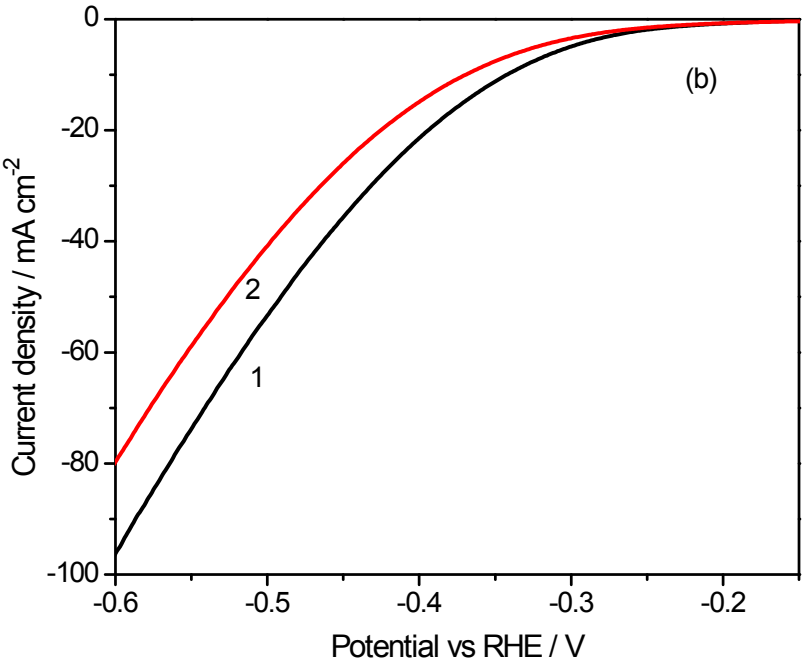


Figure S3 : LSVs of different electrodes before and after chronoamperometric stability tests a) $CuNiS_x$, (b) CuNi, (c) Cu_xS


0.00
-0.05
-0.10
-0.15
-0.20
-0.25
Current density / mA cm-2
(a)
2
1
-0.5
-0.4
-0.3
-0.2
-0.1
Potential vs RHE / V


0
-20
-40
-60
-80
-100
Current density / mA cm-2
(b)
2
1
-0.6
-0.5
-0.4
-0.3
-0.2
Potential vs RHE / V

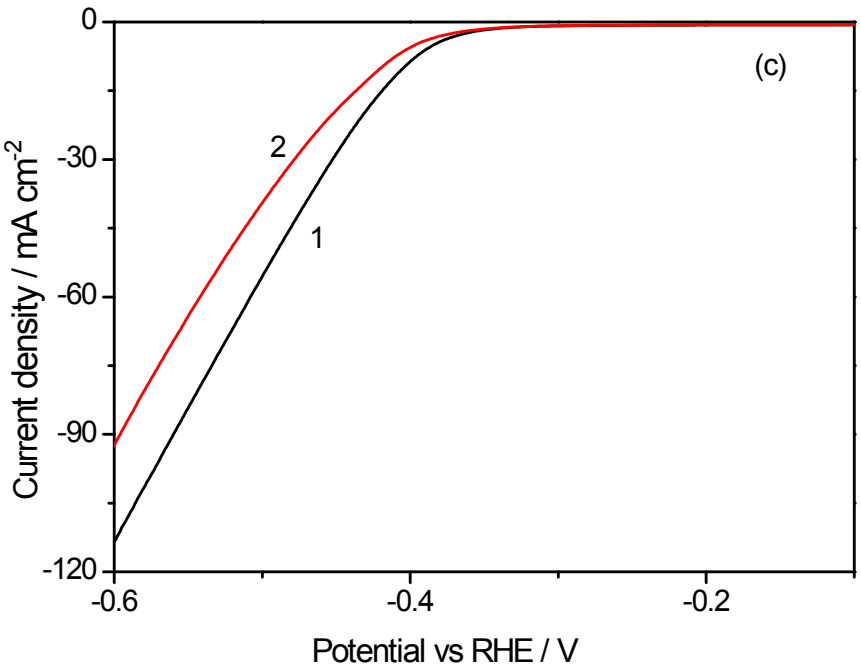
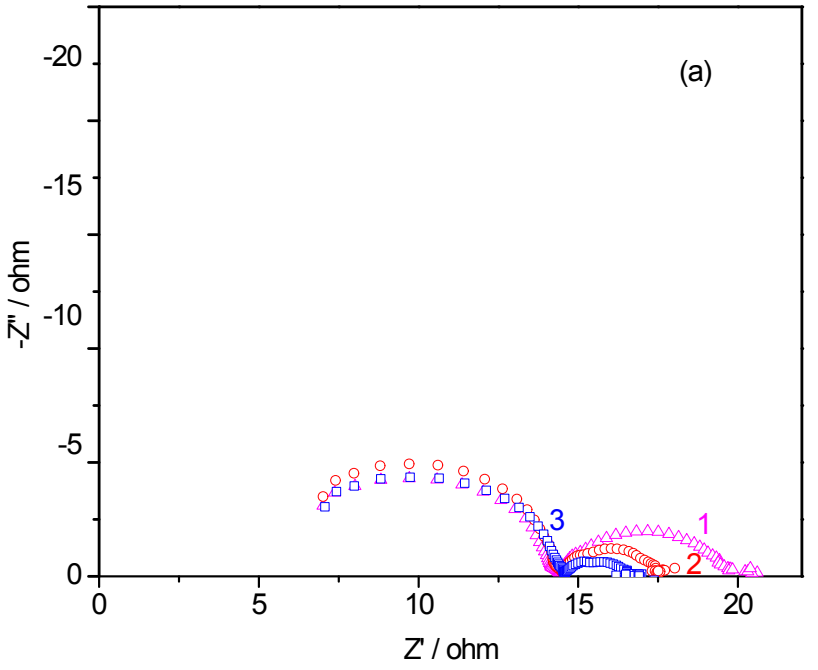
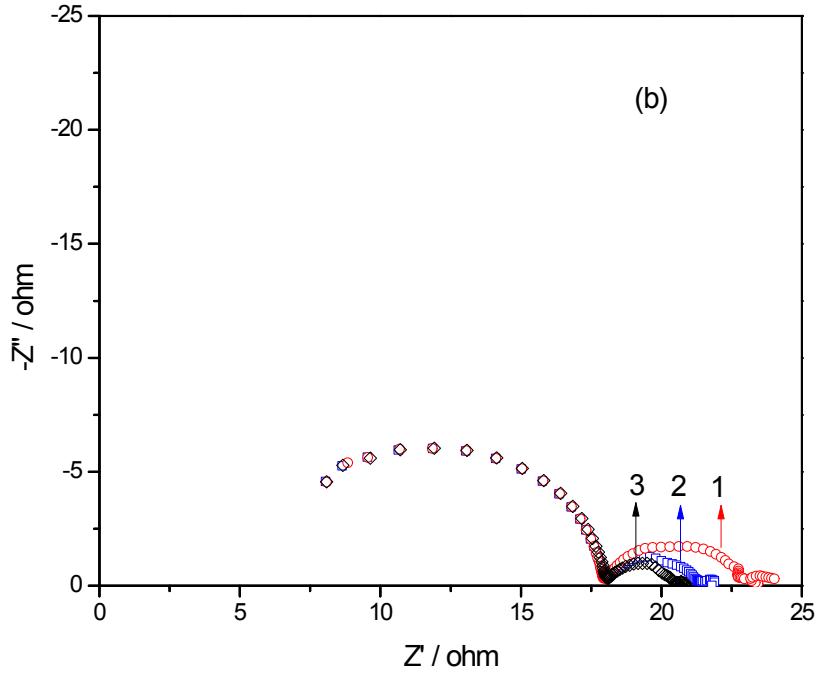

0
-30
-60
-90
-120
-0.6
-0.4
-0.2
Current density / mA cm-2
Potential vs RHE / V
(c)
2
1

Figure S4:Potential dependant Nyquist plots of (a) $CuNiS_x$, (b) CuNi, (c) Cu_xS in 0.5 M H_2SO_4 . 1 – at -0.2 V , 2 at -0.3 V and 3 at -0,4 V vs RHE





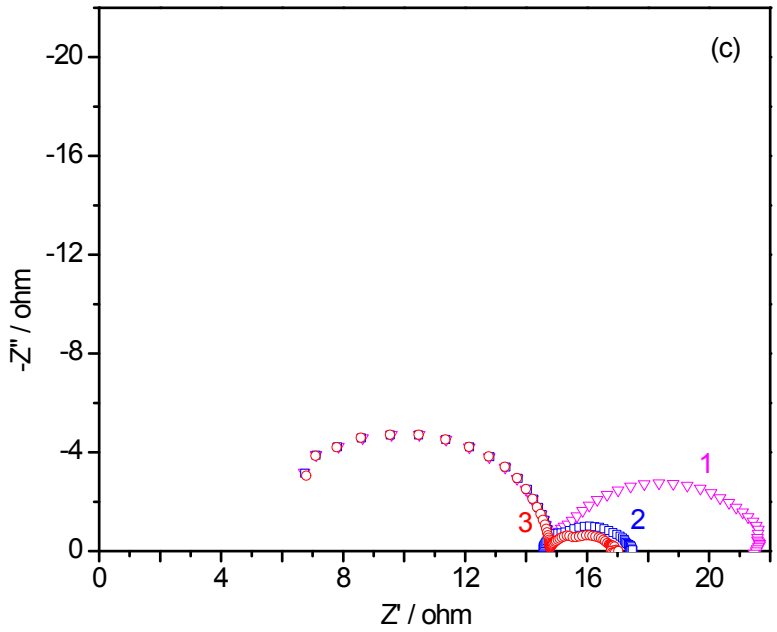
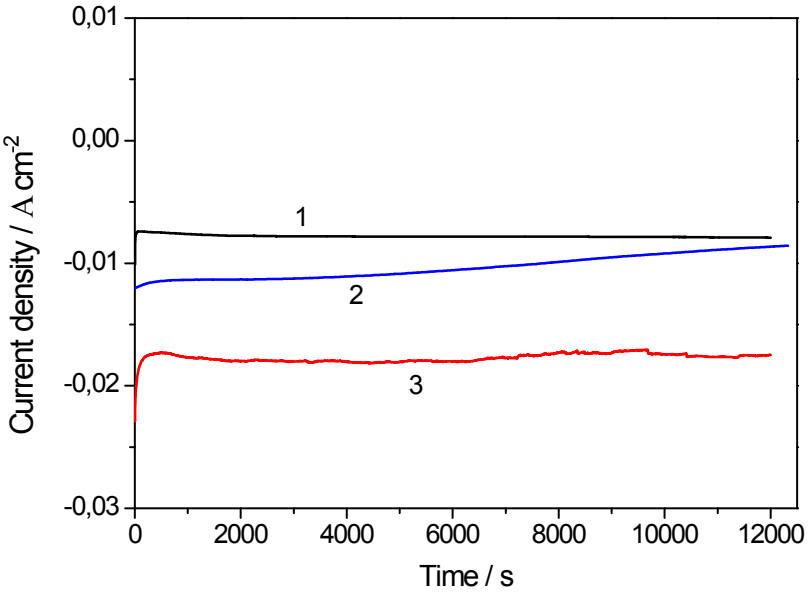

(c)
-20
-16
-12
-8
-4
0
-Z'' / ohm
0
4
8
12
16
20
Z' / ohm
1
2
3

Figure S5: Constant potential stability test of (1) Cu_xS, (2) CuNi, (3) $CuNiS_x$ performed in 0.5M H_2SO_4 using carbon rod as counter electrode.



At higher oxygen evolution rates, the surface of carbon rod undergo formation of loose carbon particles and come into the electrolyte solution.However the current density behaviour are similar to the Pt counter.

Table S1: Comparison of overpotential requirement and Tafel slope values for different electrocatalyst and the present thin film electrode materials.

Electrocatalyss	Cathodic overpotential for 10 mA cm^{-2} in 0.5 M H_2SO_4 / mv	Tafel Slope / mV/dec
Pt/C	30	30
MoS_2	230	101
MoS_2/RGO	150	40
MoS_2-$CoSe_2$	68	36
$CoSe_2$	130	48
$NiSe_2$	230	57
NiS_2	240	42
CoS_2	230	44
FeS_2	270	62
*Cu_xS	270	102
*$CuNiS_x$	213	98
*CuNi	195	128
Cu - bare	465	158

'present work, direct deposition by electrochemical method, without any conductive binders

References

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