Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

MoS_2/CuO-Based Hybrid p-n Junction for High-Performance Self-Powered Photodetection

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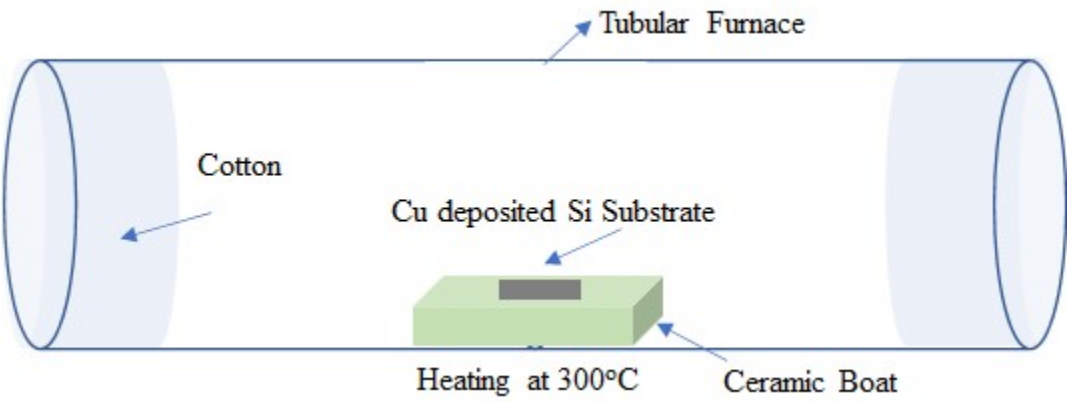

Figure S1 Tubular furnace set up to oxidise sputtered Cu film.

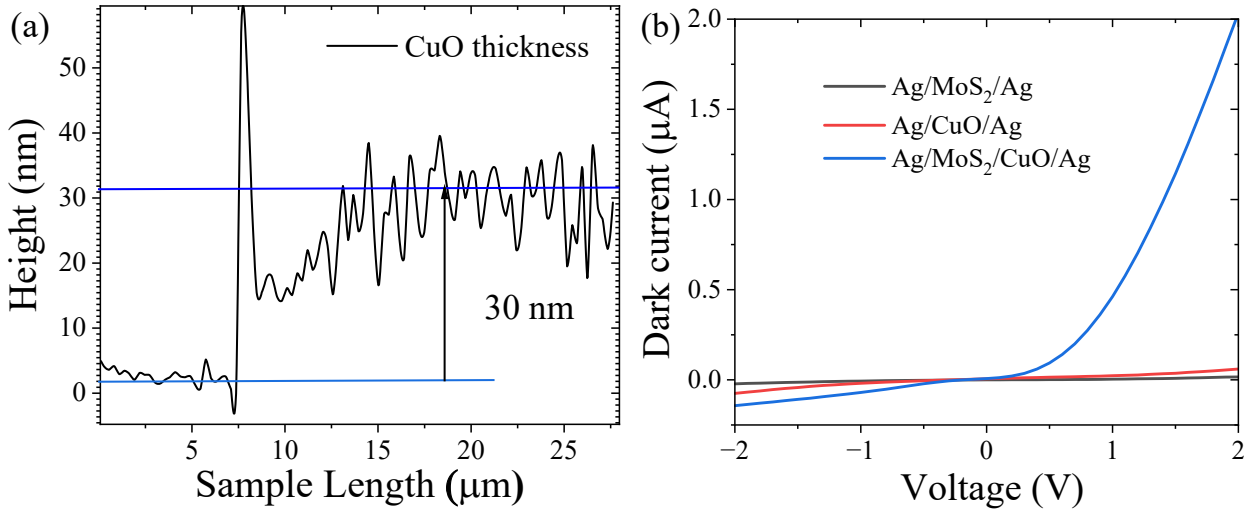

Figure S2 (a) AFM image showing the thickness of CuO. (b) Dark I-V characteristics of individual $Ag/MoS_2/Ag$, Ag/CuO/Ag MSM devices and $Ag/MoS_2/CuO/Ag$ heterostructure device.

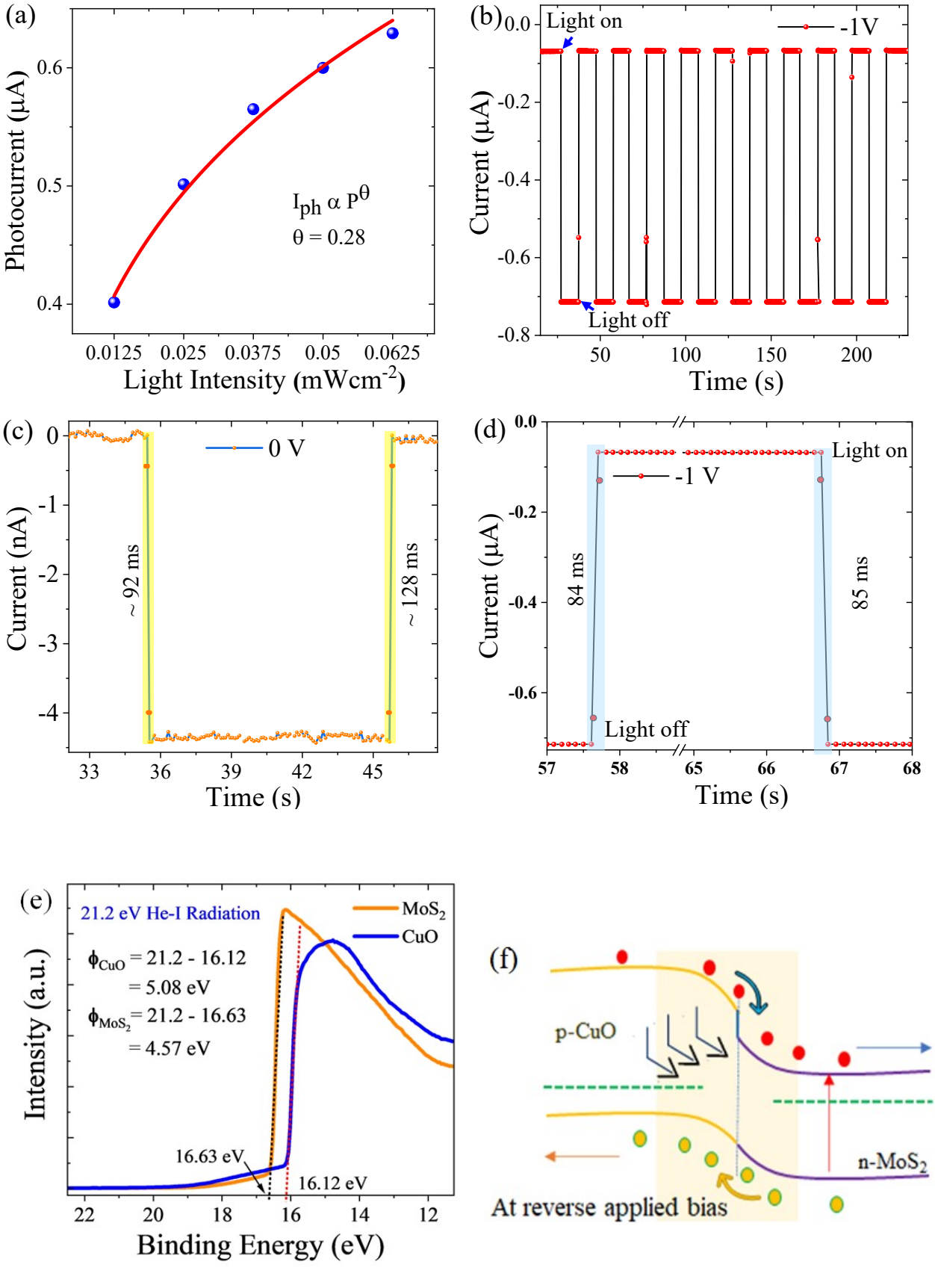
(a)
Photocurrent (μA)
0.4
0.5
0.6
0.0125
0.025
0.0375
0.05
0.0625
Light Intensity (mWcm-2)
Iph α Pθ
θ = 0.28
(b)
Light on
-1V
Current (μA)
0.0
-0.2
-0.4
-0.6
-0.8
Light off
50
100
150
200
Time (s)
(c)
0 V
Current (nA)
0
-1
-2
-3
-4
~ 92 ms
~ 128 ms
33
36
39
42
45
Time (s)
(d)
Light on
-1 V
Current (μA)
0.0
-0.2
-0.4
-0.6
84 ms
85 ms
Light off
57
58
65
66
67
68
Time (s)
(e)
21.2 eV He-I Radiation
MoS2
CuO
ϕCuO = 21.2 - 16.12
= 5.08 eV
ϕMoS2 = 21.2 - 16.63
= 4.57 eV
Intensity (a.u.)
16.63 eV
16.12 eV
22
20
18
16
14
12
Binding Energy (eV)
(f)
p-CuO
n-MoS2
At reverse applied bias

Figure S3 (a) Photocurrent vs light intensity at -1.0 V applied bias. (b) Current on/off switching behavior of MoS_2/CuO device at -1.0 V applied bias. Transient photoresponse to determine the photodetection speed at (c) zero bias (d) -1.0 V. (e) UPS spectra of MoS_2 and CuO to determine work function and (f) Band alignment of MoS_2/CuO p-n heterojunction at applied reverse bias of -1.0 V.