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# Supporting Information

# Sequential Deposition as a Route to Efficient $Sb_2S_3$ Solar Cells

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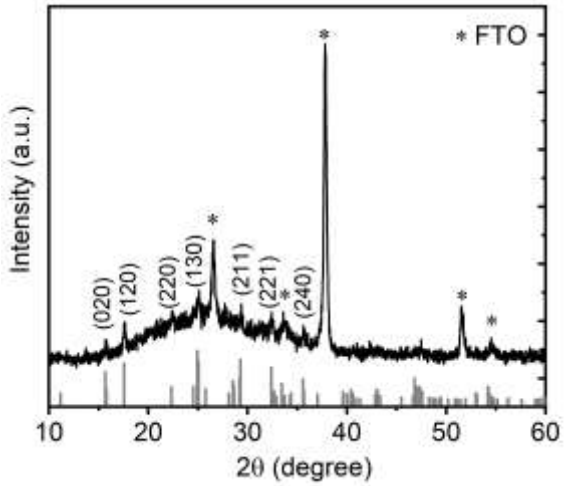


Figure S1. The detailed index of XRD pattern of $Sb_2S_3$ thin films prepared from 6 M TU deposited on $Sb(Ac)_3$ film annealed at 320 $^oC$ for 2 min.

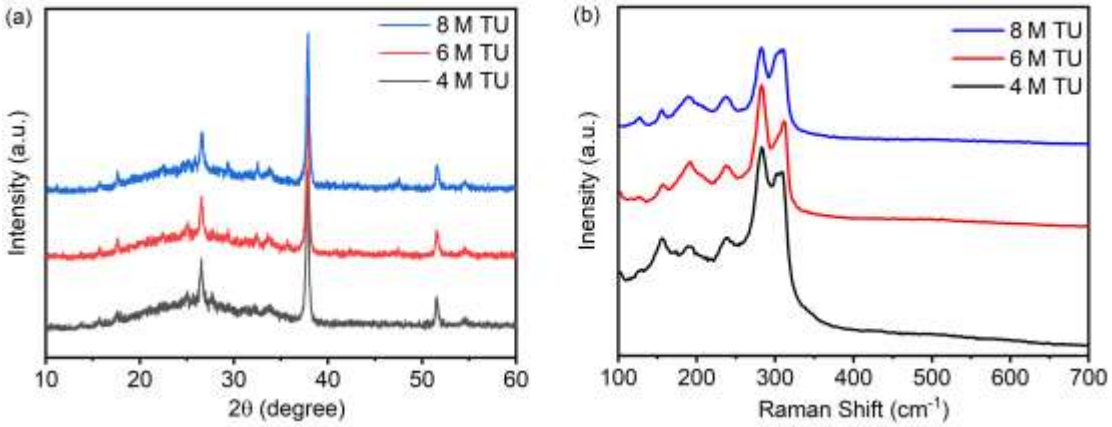


Figure S2. (a) The XRD spectra and (b) the Raman spectra of $Sb_2S_3$ thin films prepared from 4 M, 6 M and 8 M TU deposited on $Sb(Ac)_3$ film annealed at 320 $^oC$ for 2 min, respectively.

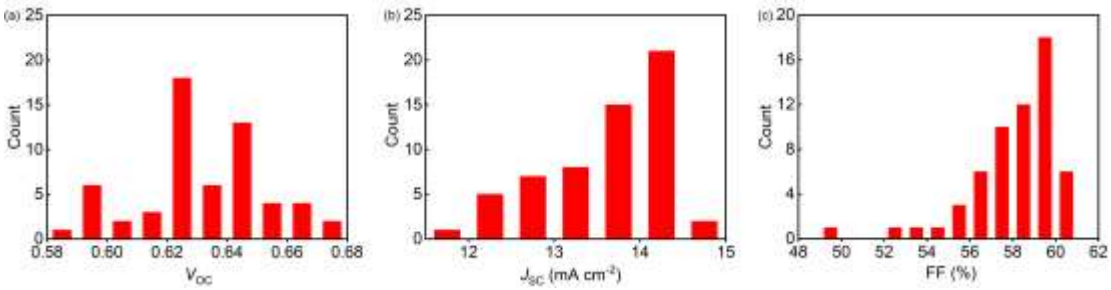


Figure S3. The histogram of device (a) $V_{OC}$ (b) $J_{SC}$, and (c) FF obtained from 59 individually fabricated solar cells with $Sb_2S_3$ thin films prepared from 6 M TU annealing at 320 $^{o}$C for 2 min.

Table S1. Photovoltaic parameters of the devices with different thicknesses of $Sb_2S_3$

| Thickness (nm) | PCE (%) | $V_{OC}$ (V) | $J_{SC}$ ($mA.cm^{-2}$) | FF (%) |
|---|---|---|---|---|
| 62 | 5.69 | 0.66 | 14.34 | 60.43 |
| 82 | 4.42 | 0.64 | 12.02 | 57.81 |
| 96 | 3.34 | 0.61 | 10.36 | 53.10 |
| 120 | 2.25 | 0.61 | 8.93 | 41.05 |

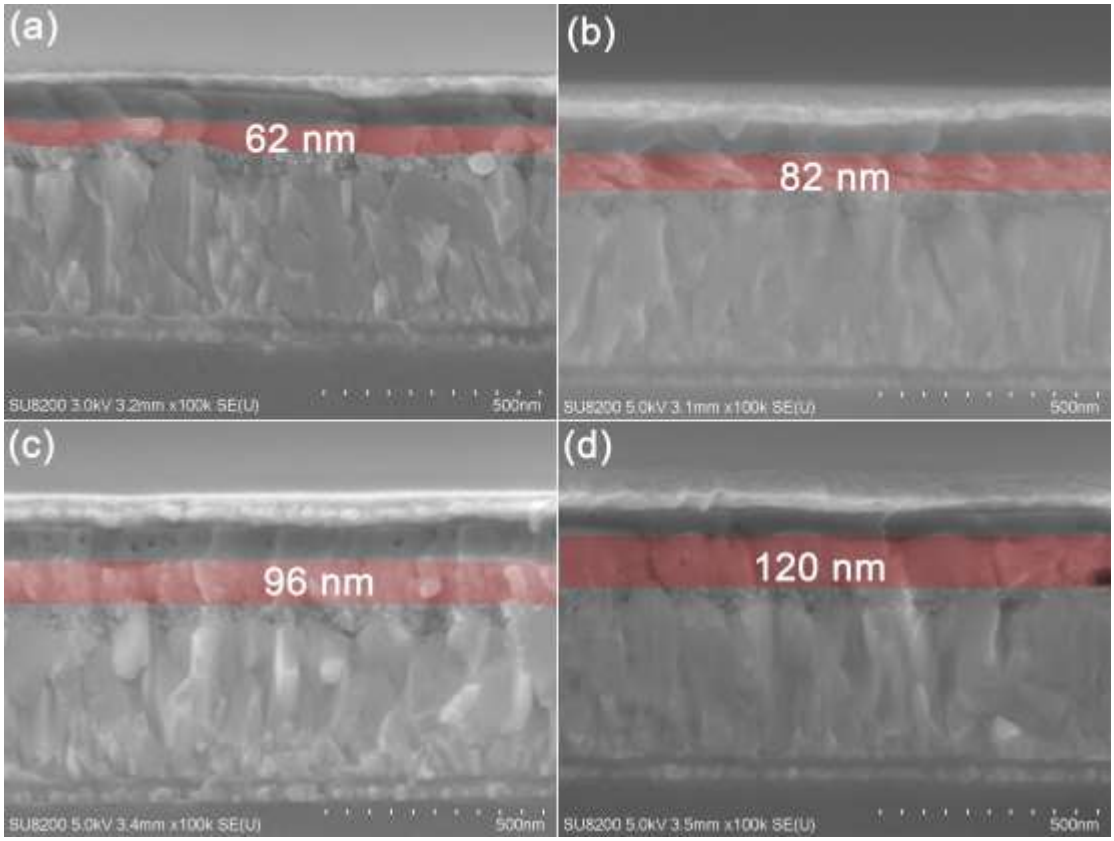


Figure S4. The different thicknesses of $Sb_2S_3$ films for devices according to SEM: (a) 62 nm, (b) 82 nm, (c) 96 nm and (d) 120 nm.

Figure S5. The digital image of $Sb_2S_3$ thin film prepared from 6 M TU annealing at 320 $^oC$ for 2 min.