

Supporting information

The Role of NaF Post-Deposition Treatment on the Photovoltaic Characteristics of Ultrathin Cu(In,Ga)Se₂ Solar Cells Prepared on Indium-Tin-Oxide Back Contact: A Comparative Study

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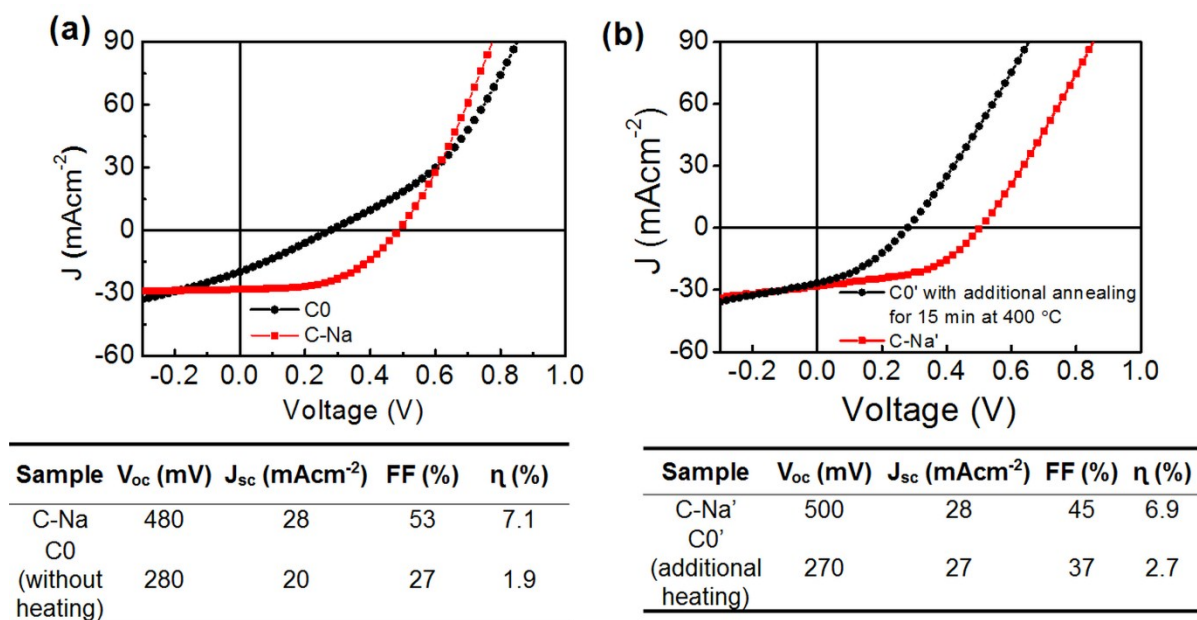


Fig. S1. Comparison of PV properties of (a) C0 without additional annealing and (b) C0' with additional annealing at 400 °C (corresponding PV parameters are given in the tables below figures).

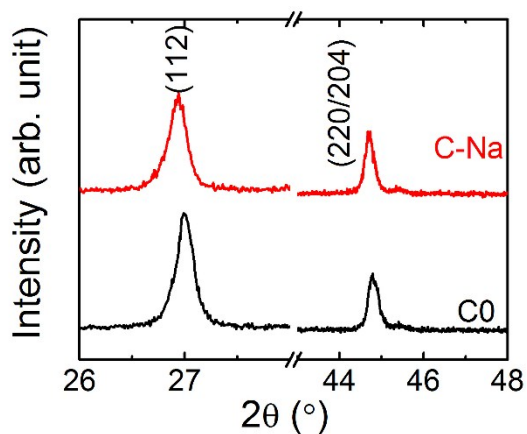
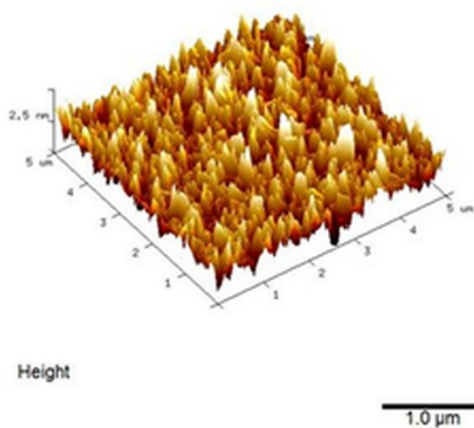
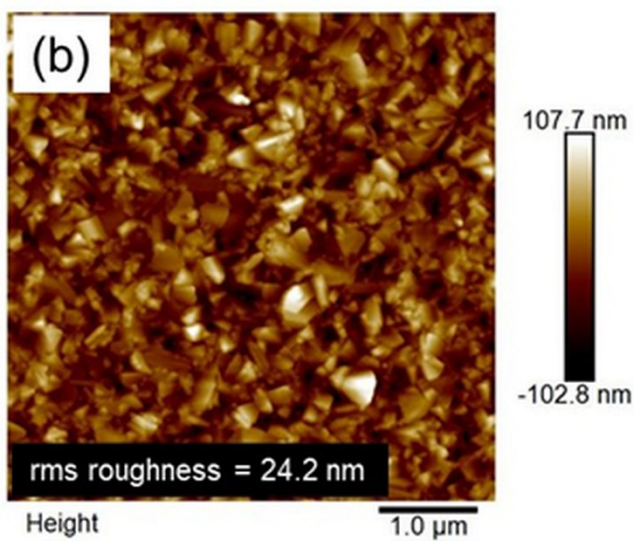


Fig. S2. 2θ - θ XRD scans of C0 and C-Na prepared on an ITO BC (XRD peak position reflected in figure are in accordance with the peaks of $\text{Cu}(\text{In}_{0.7}\text{Ga}_{0.3})\text{Se}_2$ (ICDD-PDF No. 00-035-1102)).

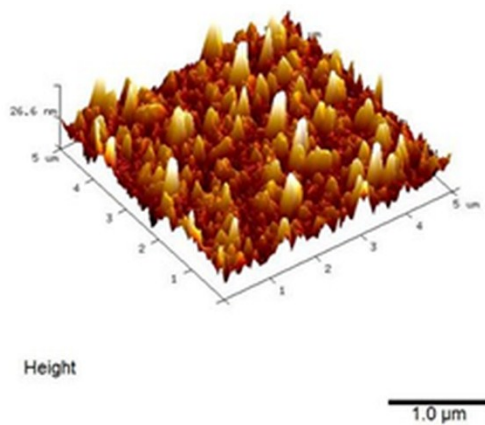
(a)



(b)



(c)



(d)

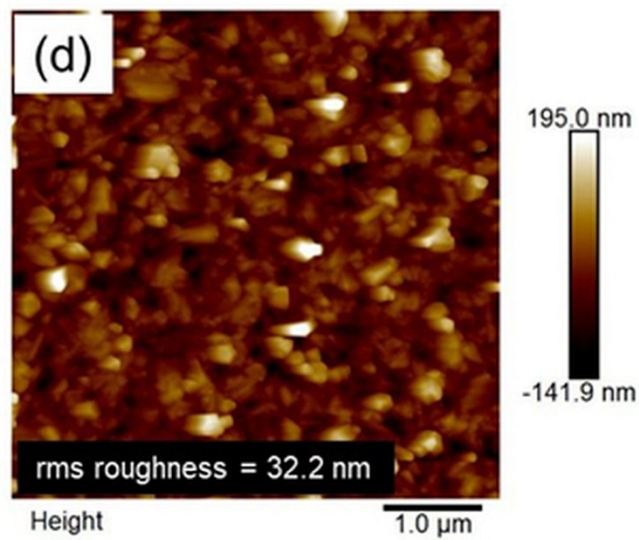


Fig. S3. 3D AFM surface topographies of (a) C0 and (c) C-Na and 2D AFM surface topographies of (b) C0 and (d) C-Na.

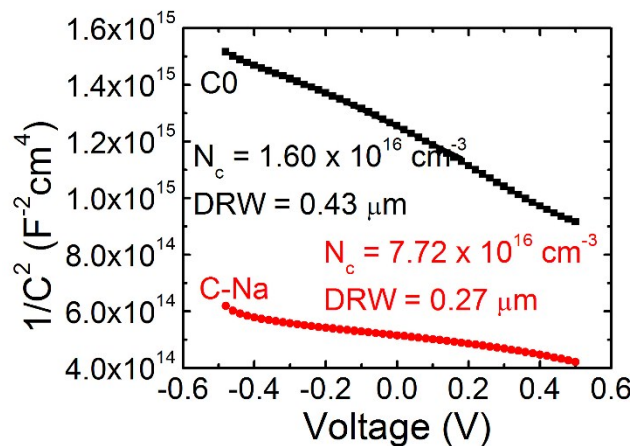


Fig. S4. $1/C^2$ versus V plot for C0 and C-Na. The measurement was performed with an AC bias and a frequency of 10 mV and 100 kHz, respectively.

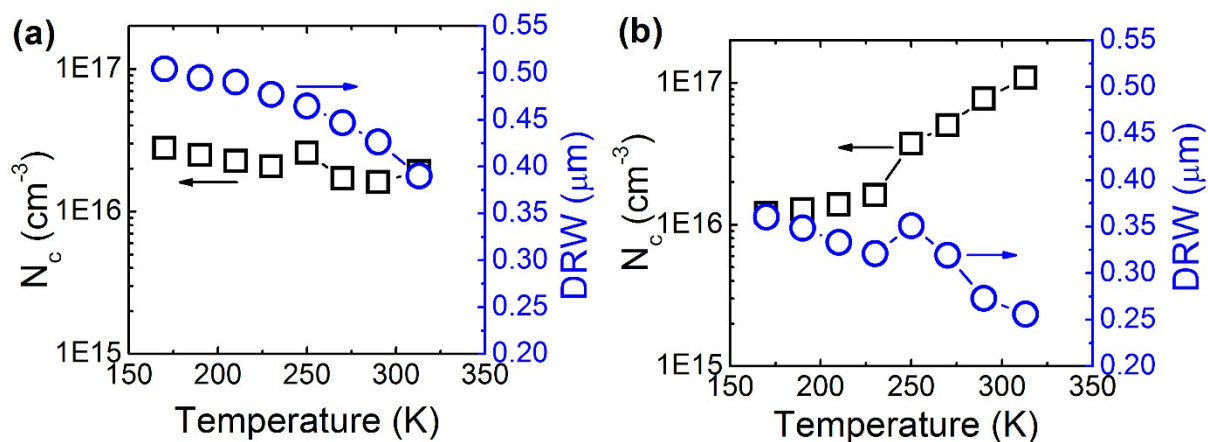


Fig. S5. N_c and DRW plots versus T from 313 to 170 K for (a) C0 and (b) C-Na. p and DRW values from the relevant CV data.

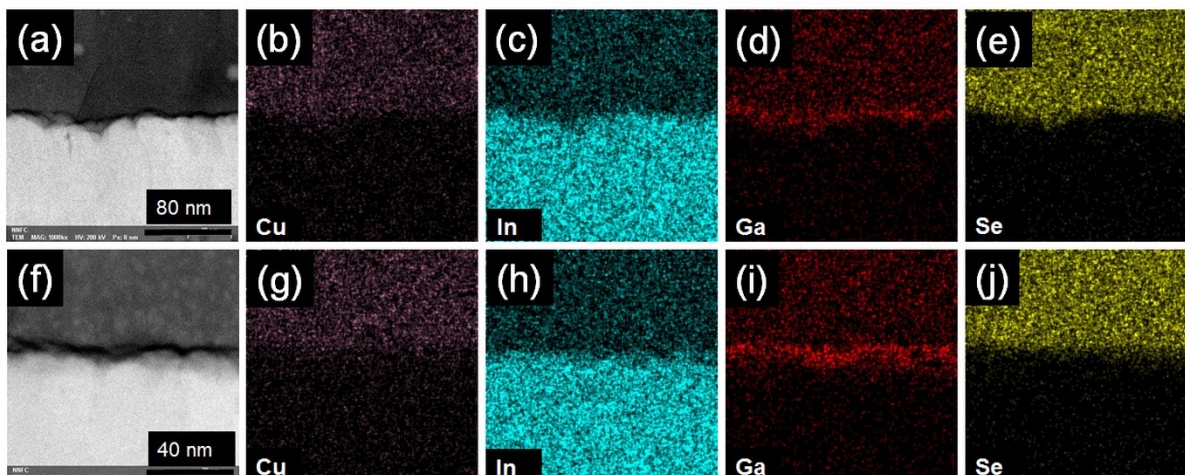


Fig. S6. TEM cross-sectional images of (a) C0 and (f) C-Na and the corresponding TEM-EDS elemental maps for (b) Cu in C0, (g) Cu in C-Na, (c) In in C0, (h) In in C-Na, (d) Ga in C0, (i) Ga in C-Na, (e) Se in C0 and (j) Se in C-Na.

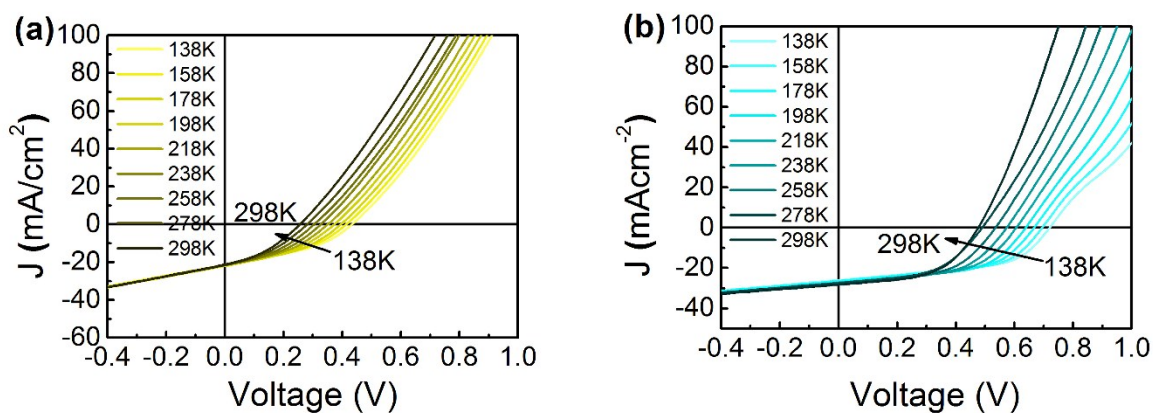


Fig. S7. T-dependent light-JV data of (a) C0 and (b) C-Na from 138 to 298 K under neutral white light illumination.

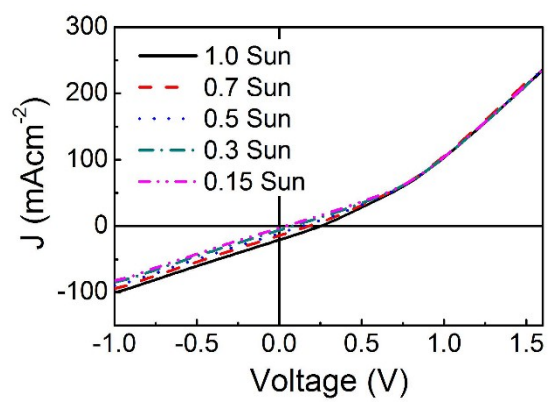


Fig. S8. Light intensity-dependent JV curves for C0.