Electronic supplementary information

Enhanced Charge Carrier Extraction by Highly Ordered Wrinkled MgZnO Thin Film for Colloidal Quantum Dot Solar Cells

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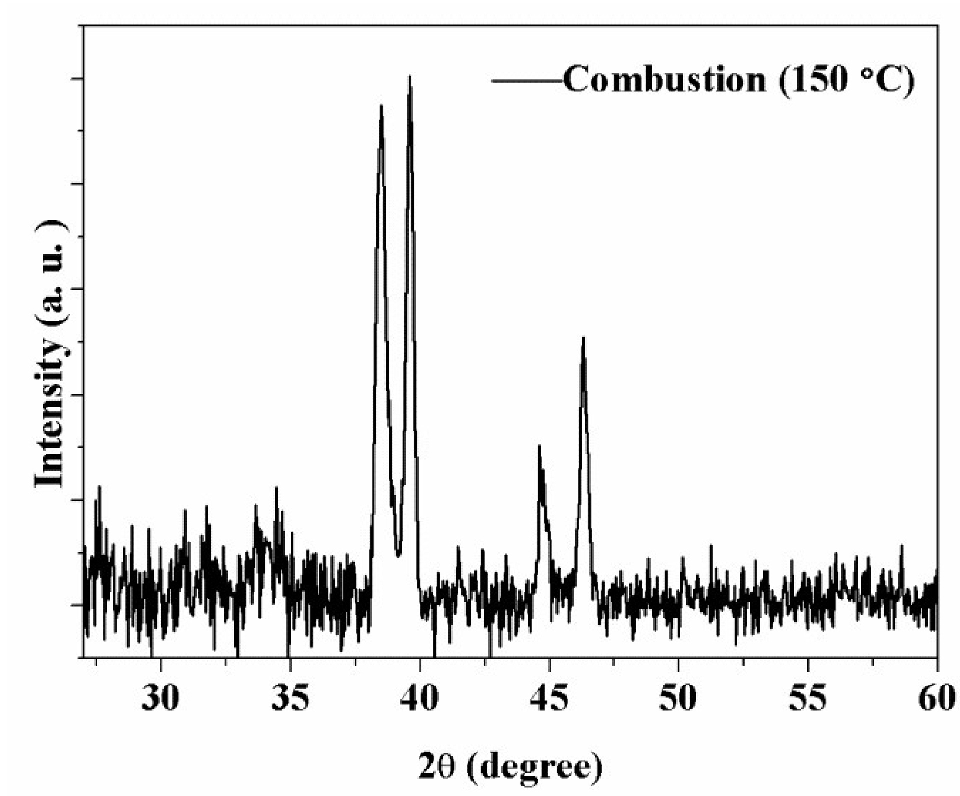

Figure S1. XRD pattern of CP-MZO thin film at 150 °C.

Due to that during the thermogravimetric analysis there may be a delay of MZO formation with a temperature scanning rate of 10 °C/min, a lower temperature of 150 °C was applied to prepare MZO thin film using the combustion method to find out the possibility of further decreasing the temperature for MZO thin film preparation. The result in Figure S2 indicates that the film in this case failed to crystallize. The sharp diffraction peaks result from the microscopy slide substrate for the measurement.

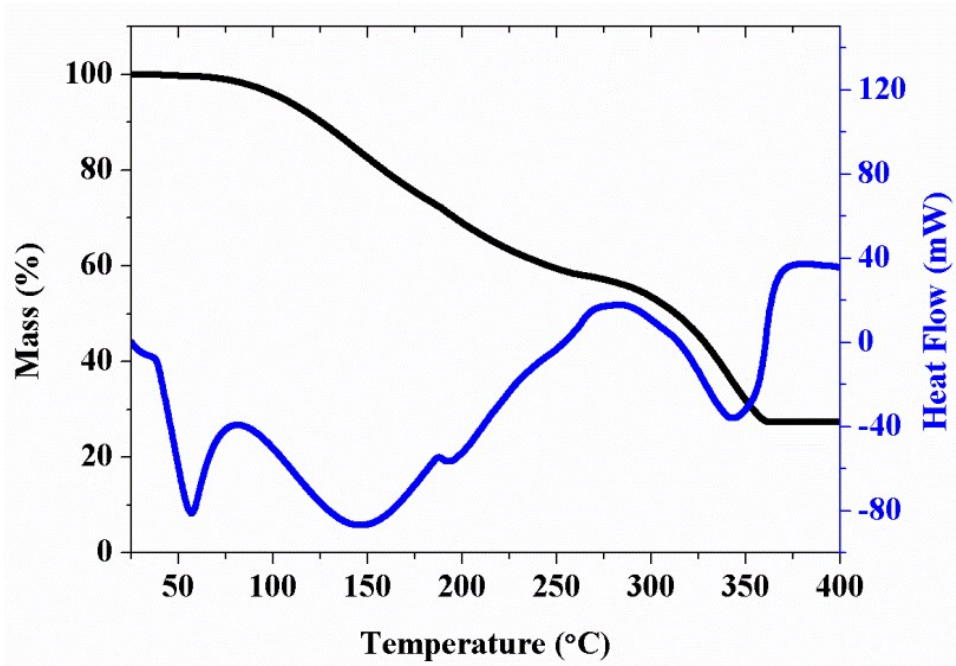

Figure S2. TGA and DSC curves of MZO prepared via combustion processes with absence of acetylacetone fuel.

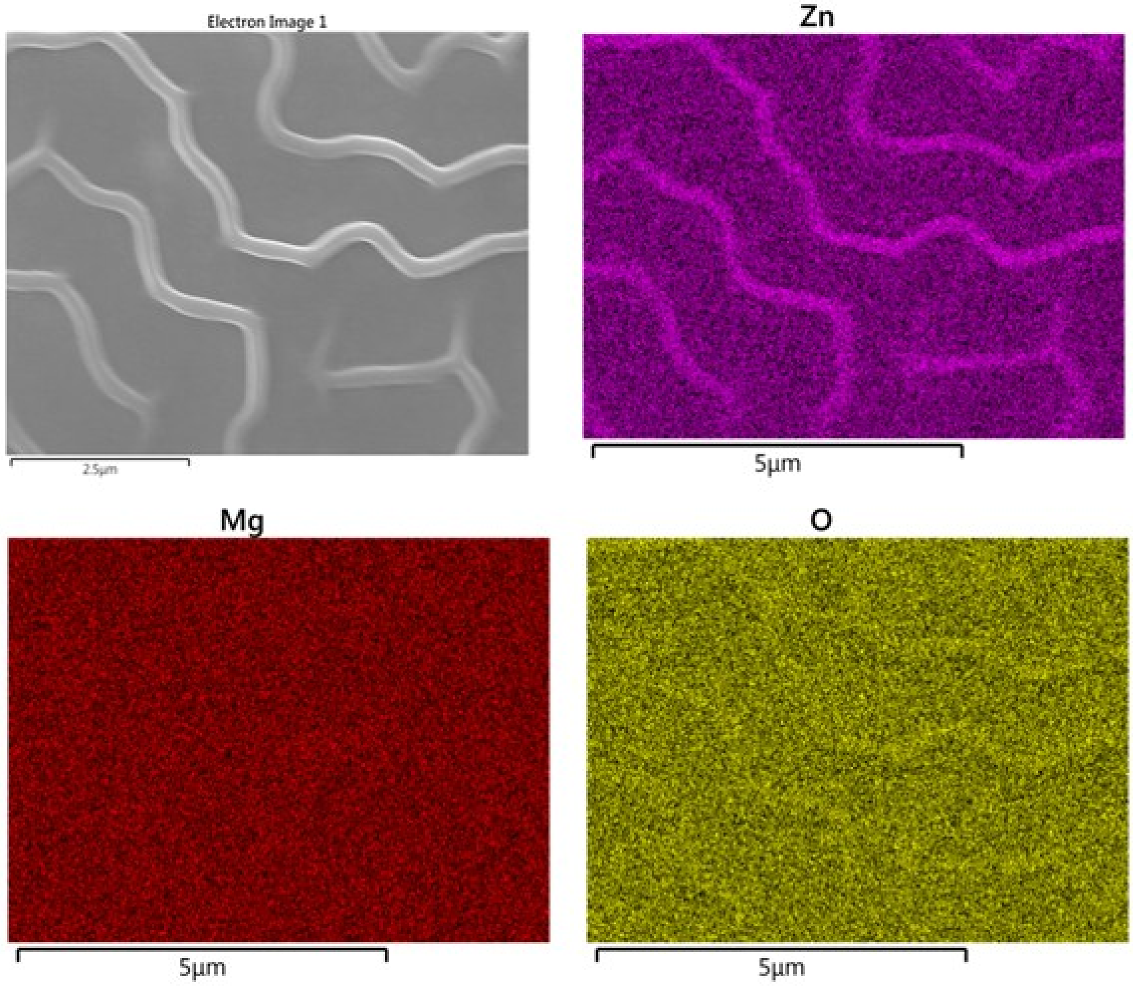

Figure S3. SEM image and elemental mapping images of Zn, Mg, and O elements, respectively.

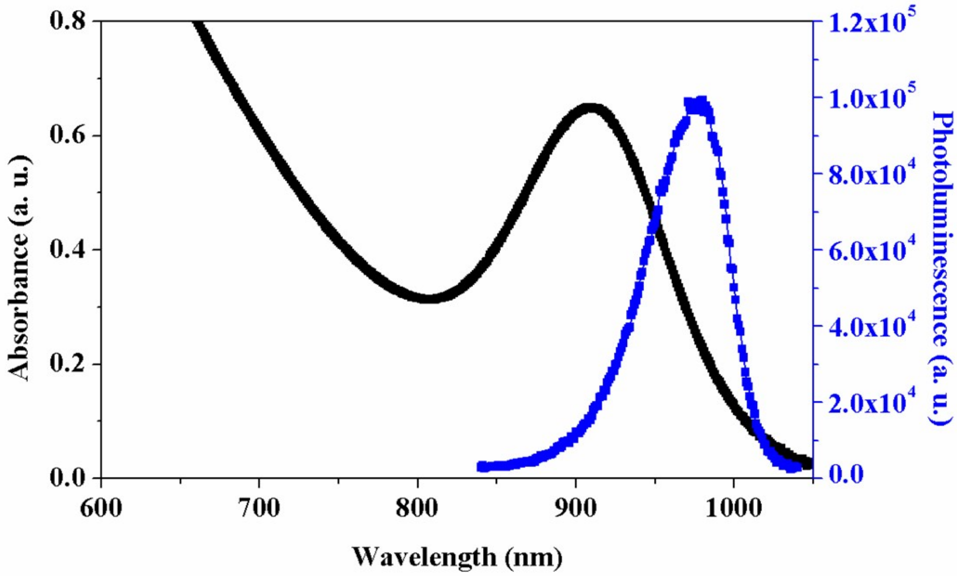

Figure S4. Light absorbance and photoluminescence spectra of the PbS CQDs.

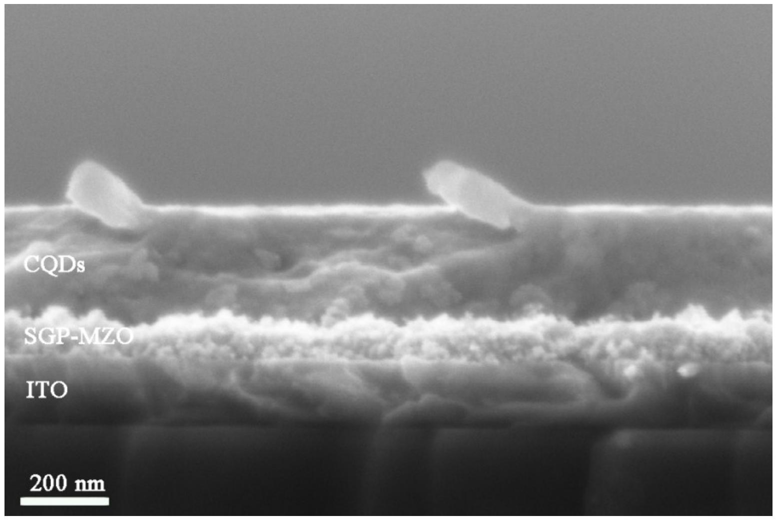

Figure S5. Cross-sectional SEM image of the CQD solar cell with SGP-MZO as an electron transport material.

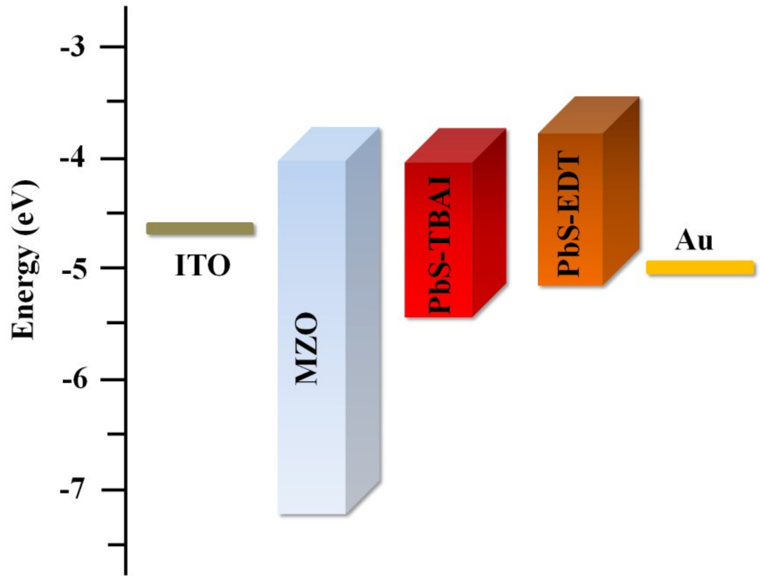

Figure S6. Approximately energy levels of each material for the CQD solar cell. The energy levels were obtained from the literature. [1-3]

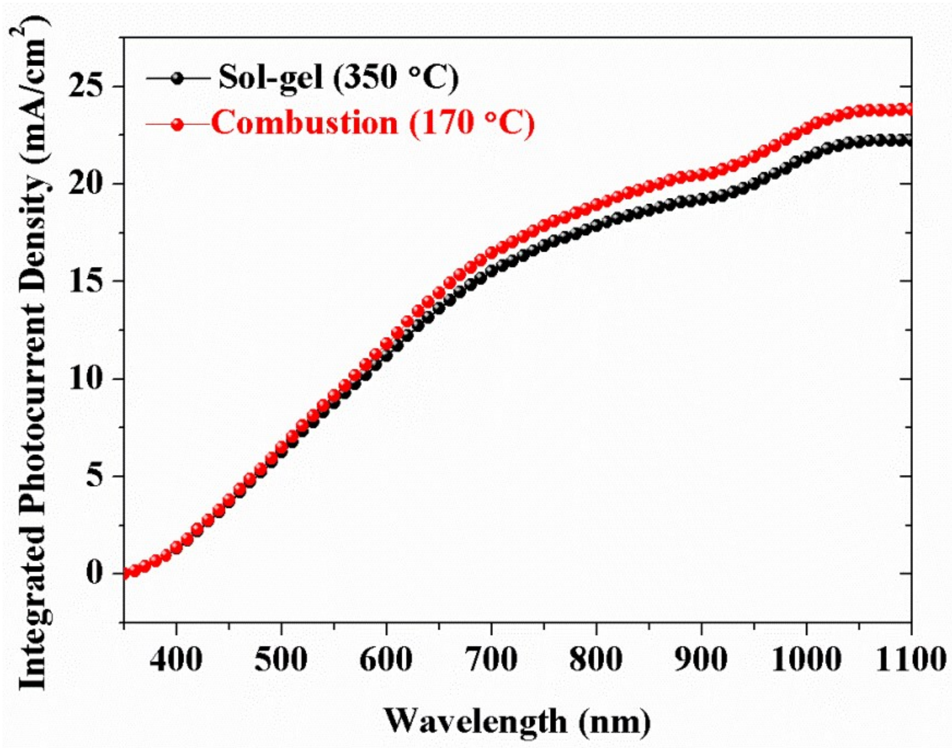

Figure S7. Integrated photocurrent density from IPCE results. The photocurrent density integrated from IPCE results are in good agreement with the results from the *J-V* measurements.

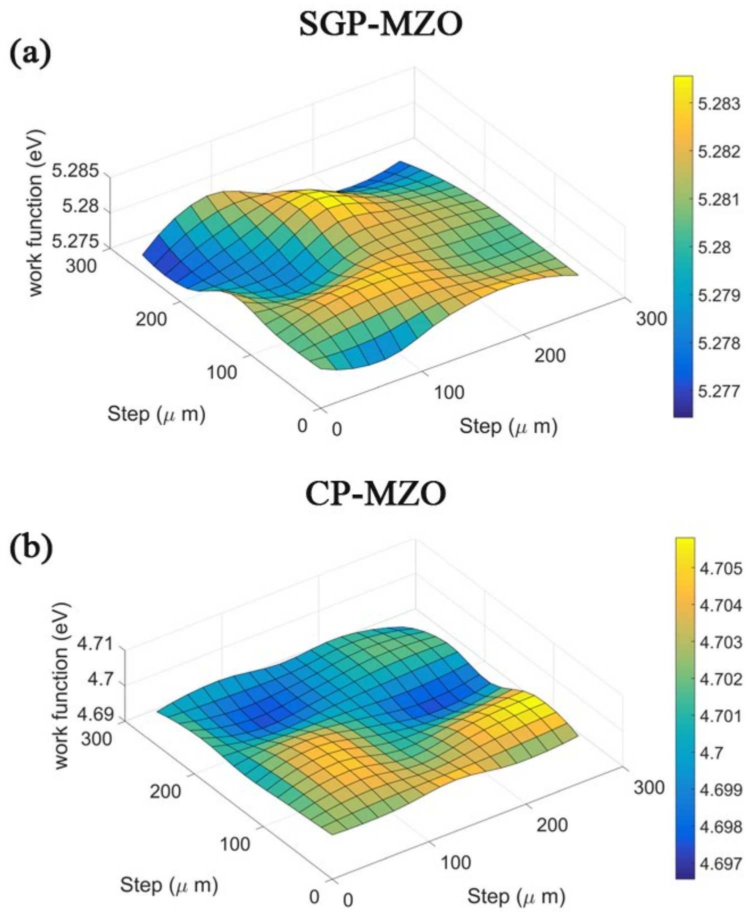

Figure S8. Work function of the (a) SGP-MZO and (b) CP-MZO thin film measured by Kelvin probe method.

References

[1] L. Hu, D. B. Li, L. Gao, H. Tan, C. Chen, K. H. Li, M. Li, J. B. Han, H. S. Song, H. Liu, J. Tang, *Adv. Funct. Mater*. **2016**, *26*, 1899-1907.

[2] X. Zhang, E. M. J. Johansson, *J. Mater. Chem. A* **2017**, 5, 303-310.

[3] J. Song, E. Zheng, L. Liu, X. F. Wang, G. Chen, W. Tian, T. Miyasaka, *Chemsuschem* **2016**, *9*, 2640-2647.