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

Transparent Solar Cell Based on Mechanically Exfoliated GaTe and IGZO p-n Heterojunction

Supporting Information

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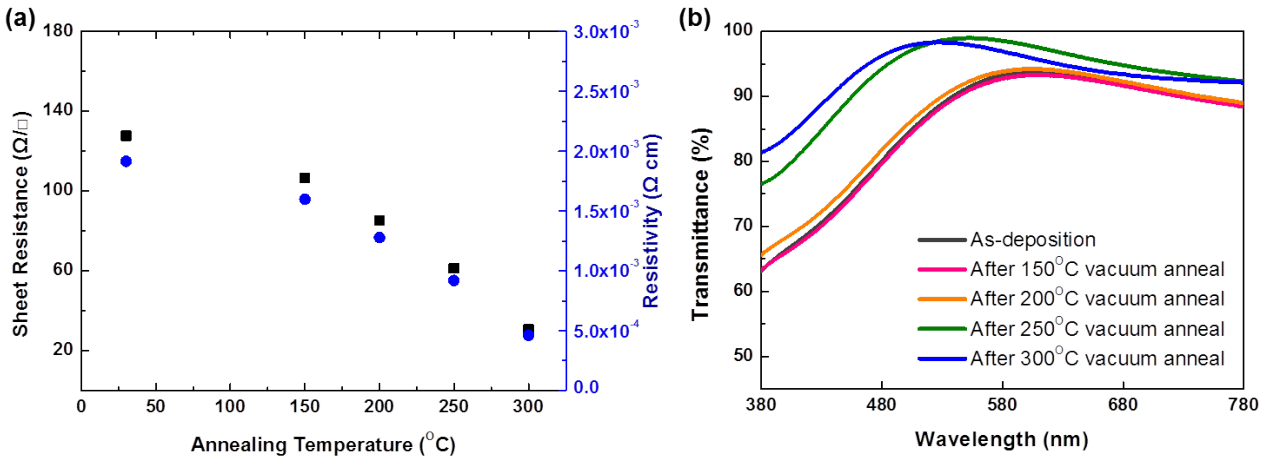

Figure S1. Electrical and optical property of 150nm-thick rf sputtered ITO film. (a) Sheet resistance and resistivity of ITO as a function of annealing temperature. (b) ITO transmittance plot in visible light spectrum with respect to annealing temperature.

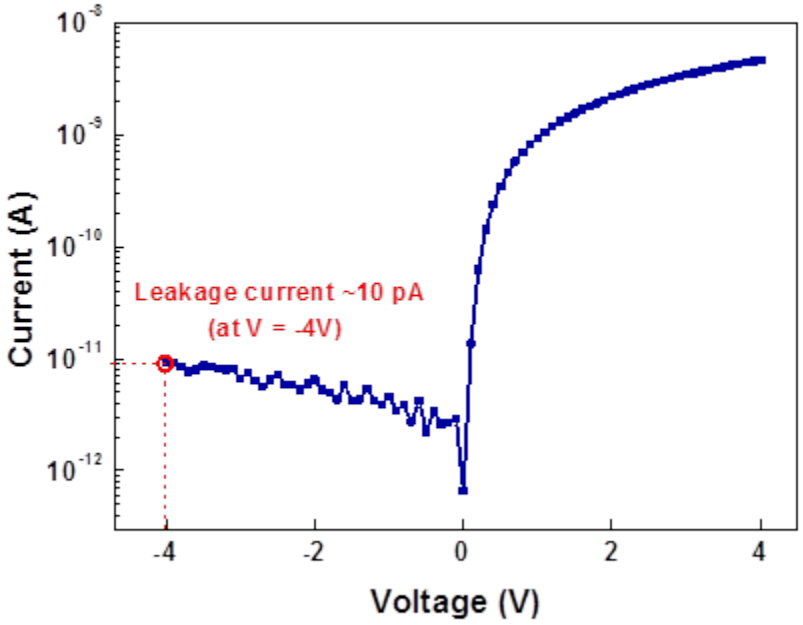

Figure S2. Semi-logarithmic I-V plot of the GaTe/IGZO p-n heterojunction in dark state showing leakage current of ~10 pA under the reverse bias of -4 V.

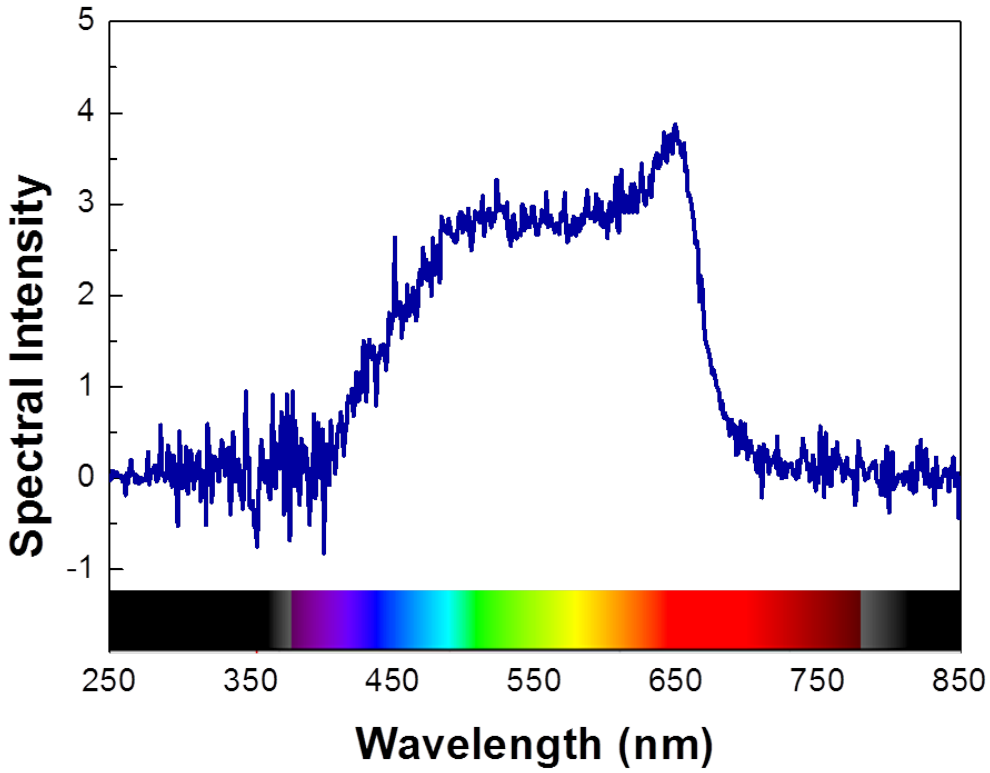

Figure S3. Spectral intensity of the halogen light source, which was used for photovoltaic performance measurement.

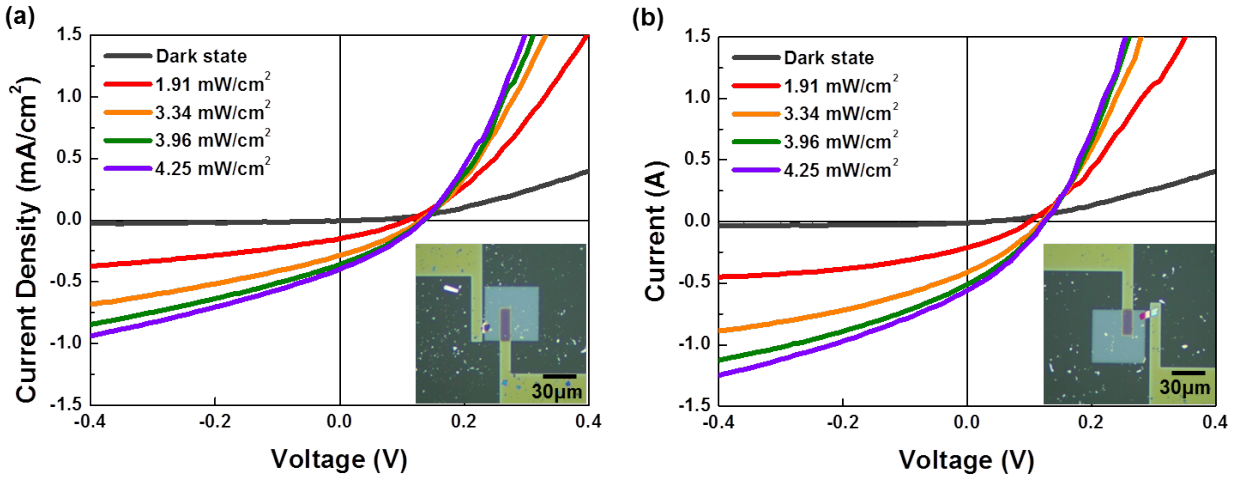

Figure S4. Photovoltaic performance of other samples. (a), (b) J-V curve under various light intensities with inset of the optical microscopic image of each sample.

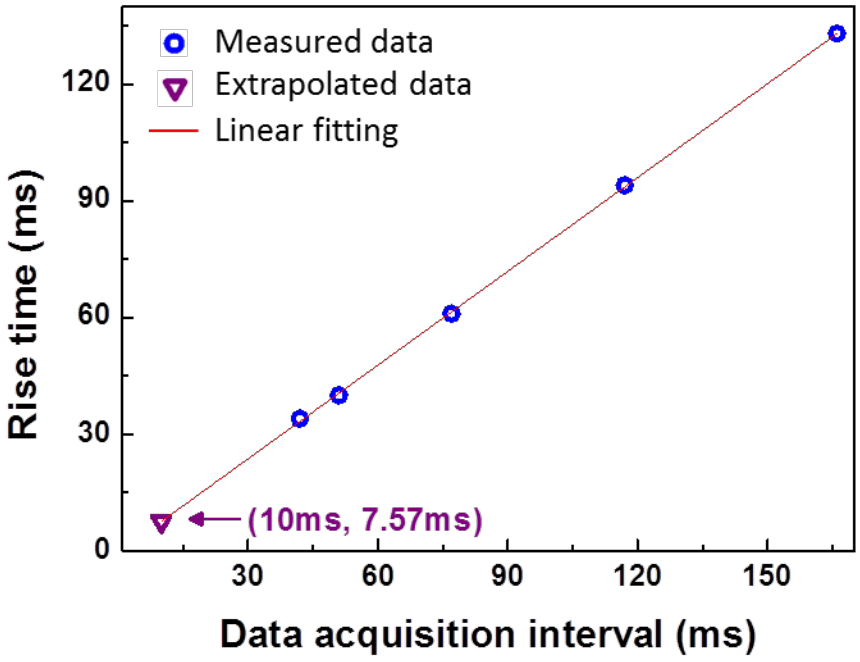

Figure S5. Rise time (extracted value from the I_{SC}-time plot under 550nm light pulse) change of a GaTe/IGZO solar cell with respect to the data acquisition interval during the measurement. Blue symbols are data points acquired by the experimental results, and red line is a linear fitting of those data. Purple symbol is the extrapolated value to expect the rise time when the measuring speed is high enough to not limit the response time, which is beyond the potential of our machine. Until the time resolution of the measuring instrument become less than the response time, the rise time tends to decrease with increasing measurement speed.

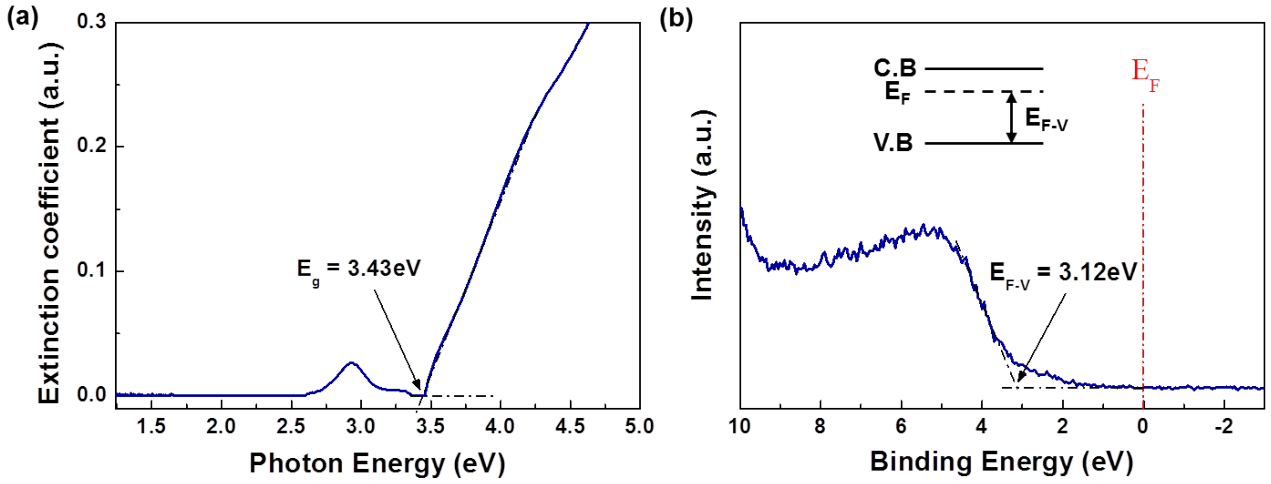

Figure S6. Band structure analysis on IGZO film. (a) Spectroscopic ellipsometry measurement data with extracted bandgap. (b) XPS spectra with extracted energy level difference between Fermi level and valence band (E_{F-V}).

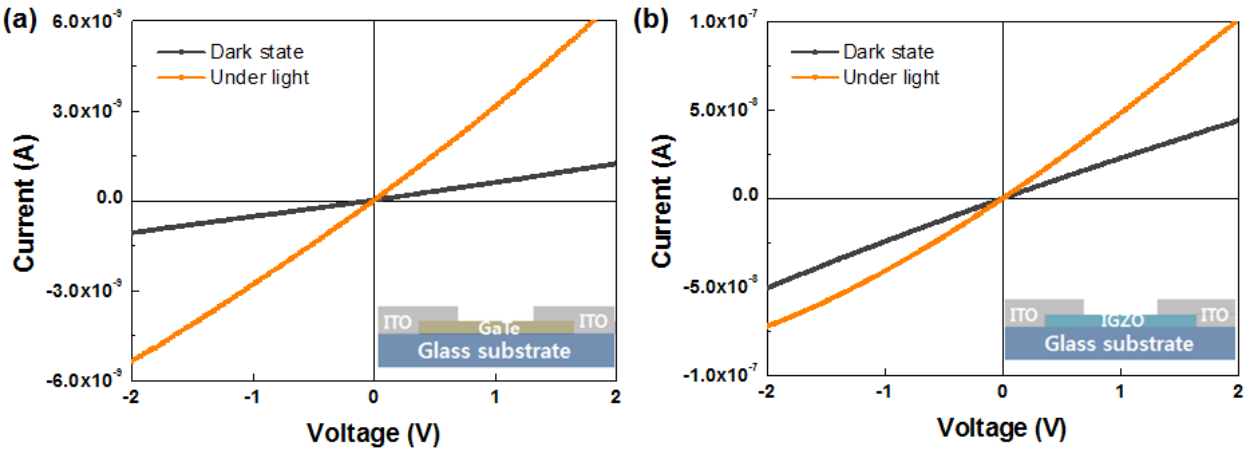

Figure S7. I-V characteristics of pure (a) GaTe and (b) IGZO semiconductors connected with ITO electrodes, under dark and illumination. They show highly linear curves confirming the ohmic contacts and did not show photovoltaic effect unlike the GaTe/IGZO heterojunction. It proves that the photovoltaic property in our device was derived from the p-n junction, not the Schottky barrier.