Supplementary Information

Efficient Solution-Processed Small-Molecule Solar Cells by Insertion of Graphene Quantum Dots

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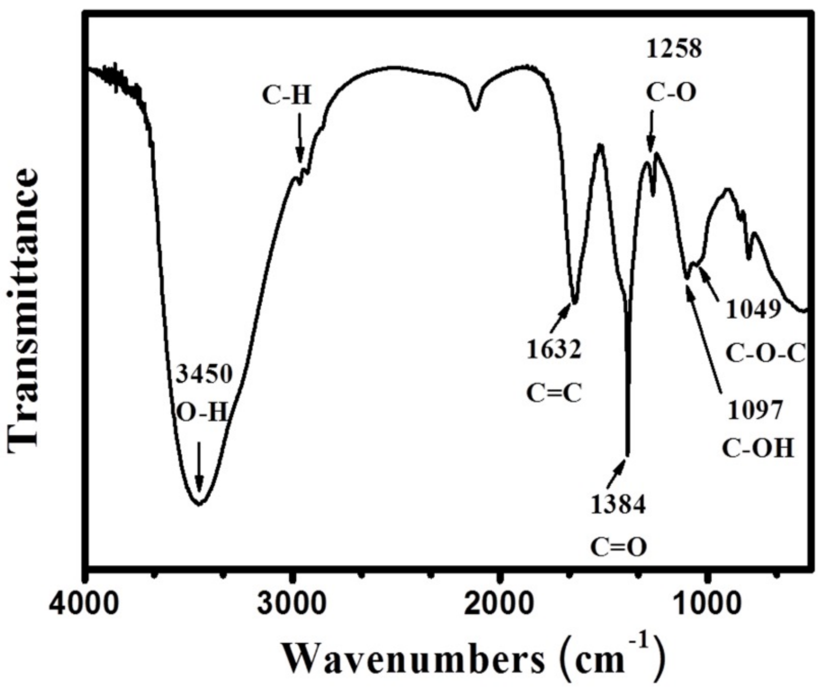

Figure S1. Fourier transform infrared spectroscopy (FT-IR) of GQDs

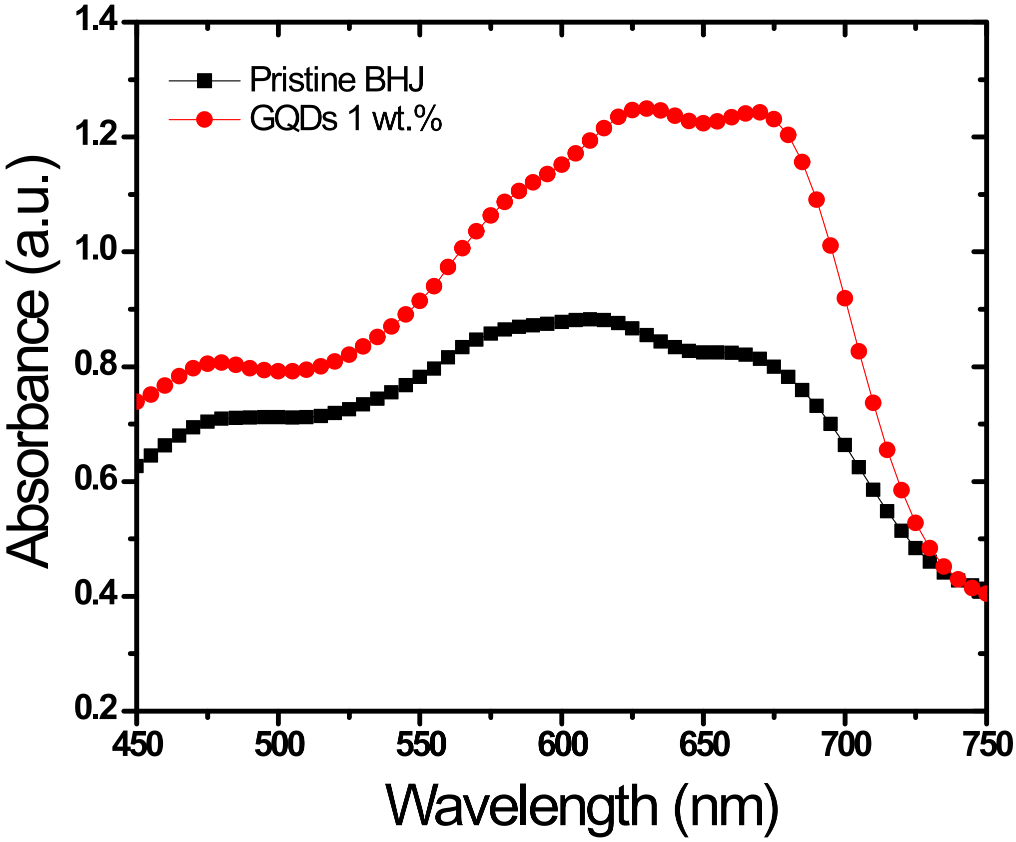

Figure S2. UV/Vis absorption spectra of the small molecule BHJ film without (pristine) and with GQDs (1 wt. %). GQDs inserted BHJ exhibits improved UV/Vis absorption property.

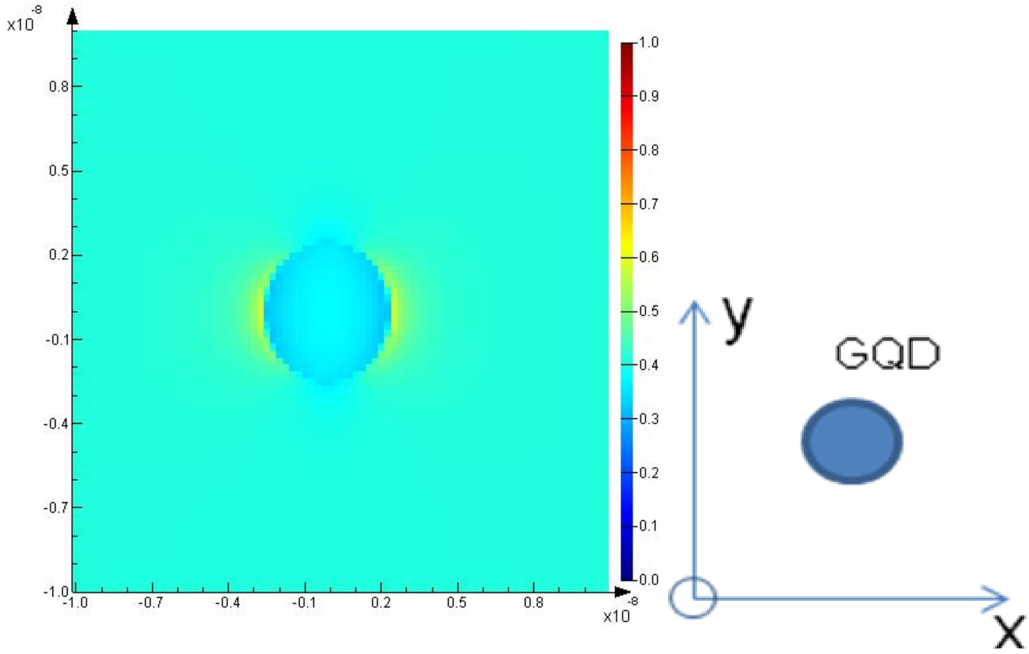

Figure S3. Optical simulation of E-field intensity distribution of GQD obtained by finite difference time domain (FDTD) analysis at the wavelength of 500 nm in thin film. For nanoparticles, the simulation region in the *x*, *y*, and *z* directions are all non-periodic. The Perfect Matched Layer (PML) boundary condition is used in the *x*, *y*, and *z* directions. The Total Field Scattered Field (TFSF) light source is used for single nanoparticle e-field simulations. The mesh size is set at 0.2 nm in order to obtain an accurate field distribution. A three-dimensional (3D) power monitor is used to obtain the E-field information for wavelengths at 500 nm. The n and k values of GQDs should satisfy the condition whereby $n^2 - k^2 < 0$; if $n^2 - k^2 > 0$, then the properties of the GQD are not metallic, and no plasmonic effect will occur. It is clearly shown in Fig. S3 that if no plasmonic effect occurs, the GQDs act similarly to a dielectric material.