Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

Enhanced Light Harvesting in Bulk Heterojunction Photovoltaic Devices with Shape-Controlled Silver Nanomaterials: Ag Nanoparticles versus Ag Nanoplates

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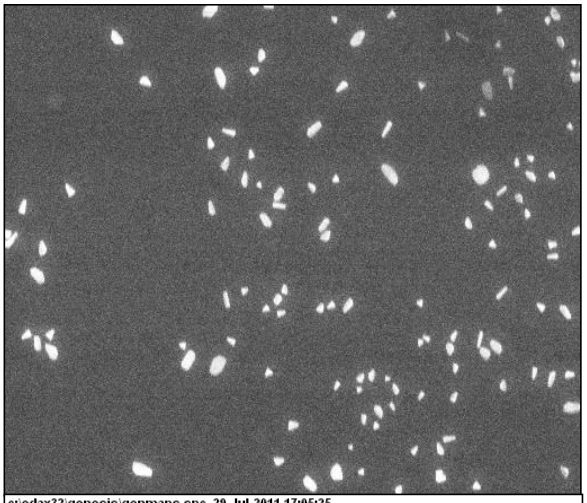
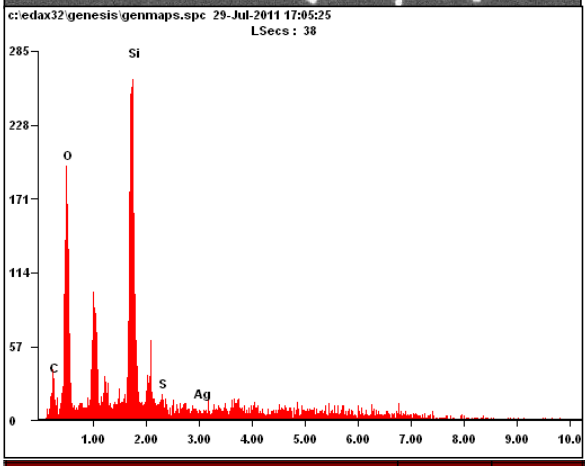
(a)



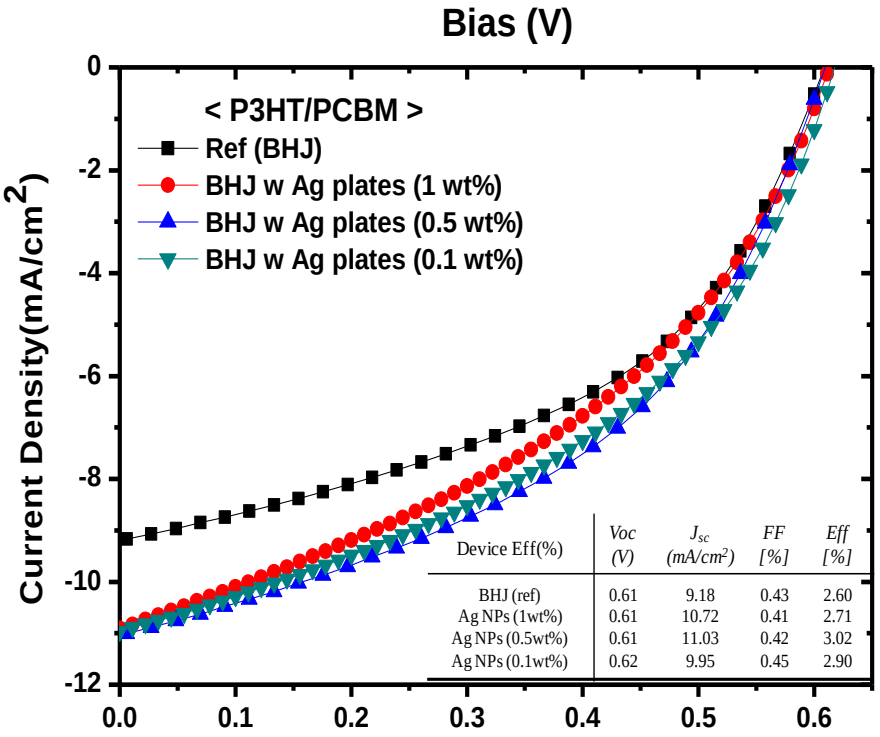
(b)



Matrix Correction: ZAFElement	*Wt%*	*At%*
C K	18.52	28.84
O K	36.50	42.68
SiK	39.66	26.41
S K	02.79	01.63
AgL	02.53	00.44

Figure S1. SEM and EDS images of Ag nanoplates with a ratio of 0.5 wt%. The EDS analysis shows that the shape of nanoplates consist of elemental Ag.

(a)



Device Eff(%)	*Voc* *(V)*	J_{sc} *(mA/cm²)*	*FF* *[%]*	*Eff* *[%]*
BHJ (ref)	0.61	9.18	0.43	2.60
Ag NPs (1wt%)	0.61	10.72	0.41	2.71
Ag NPs (0.5wt%)	0.61	11.03	0.42	3.02
Ag NPs (0.1wt%)	0.62	9.95	0.45	2.90

(b)

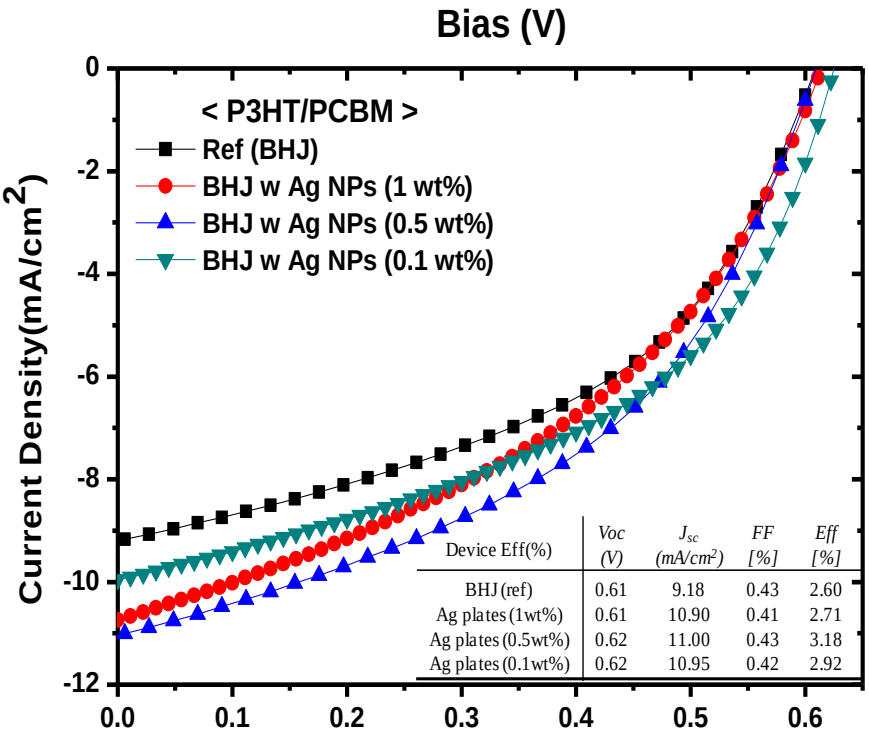


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Figure S2. *J-V* curves of devices (pre-test) with (a) the plain P3HT/PCBM BHJ and the BHJ with the Ag nanoparticles, (b) the plain P3HT/$PC_{61}BM$ BHJ and the BHJ with the Ag nanoplates; the results depend on various weight ratios of the P3HT/PCBM and the Ag materials (Ag nanoparticles or Ag nanoplates) (-●- 1 wt%, -▲- 0.5 wt%, -▼- 0.1 wt%). The each inset table showed the V_{oc}, J_{sc}, *FF*, and Eff.(%) values of the P3HT/PCBM BHJ solar cells with or without Ag nanomaterials.

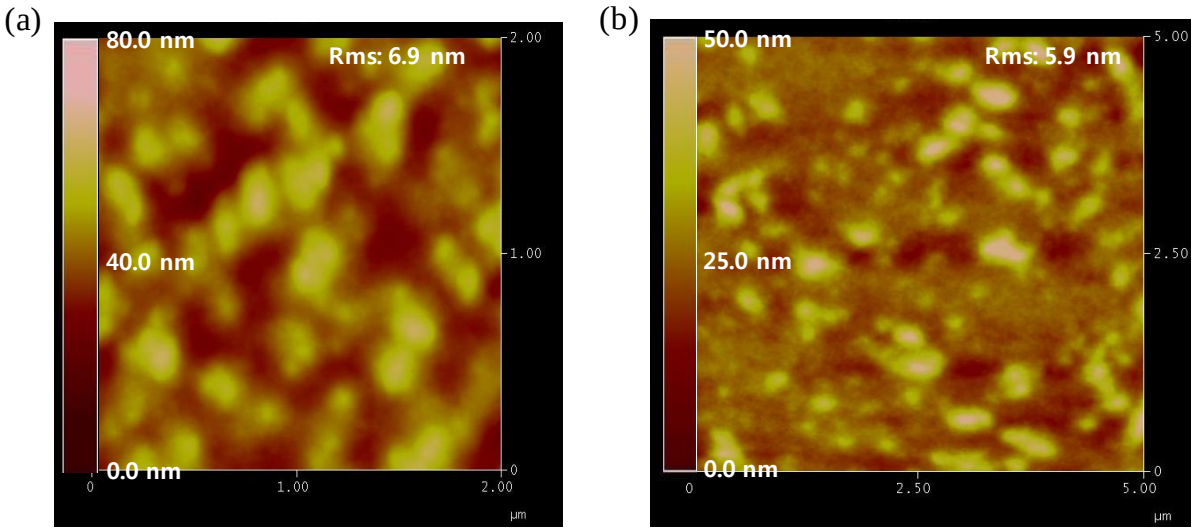

Figure S3. AFM 2D images of the plain P3HT/$PC_{71}BM$ BHJ (a) and the BHJ with Ag nanoplates (0.5 wt%) (b).

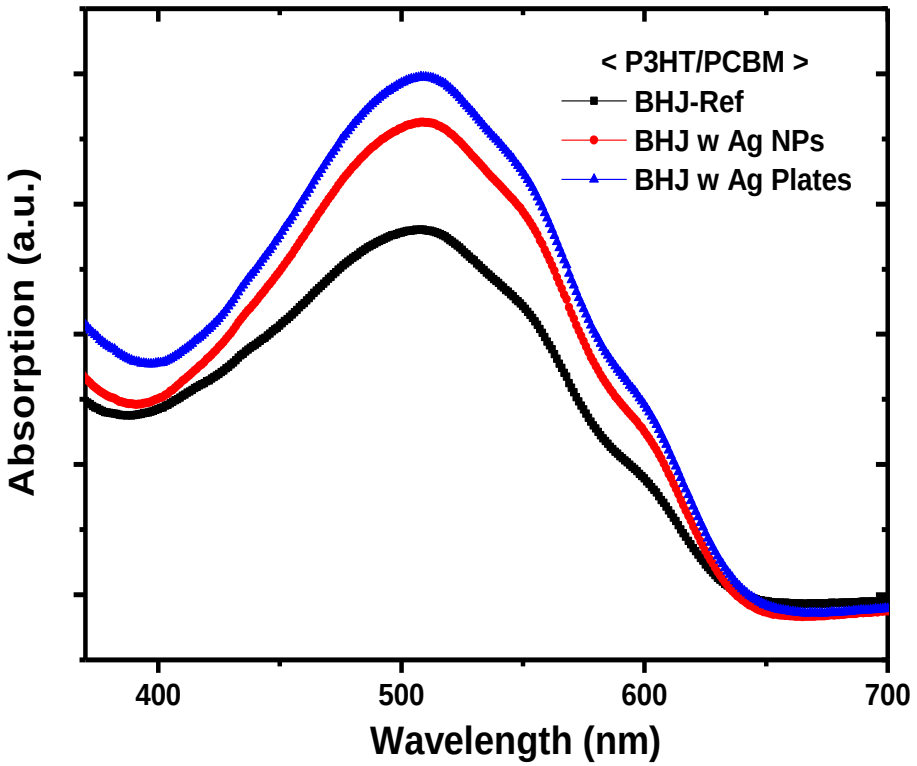

Figure S4. UV visible spectra of the plain P3HT/$PC_{71}BM$ BHJ film and the BHJ film with Ag nanoparticles or Ag nanoplates (0.5 wt%) as a function of wavelength.

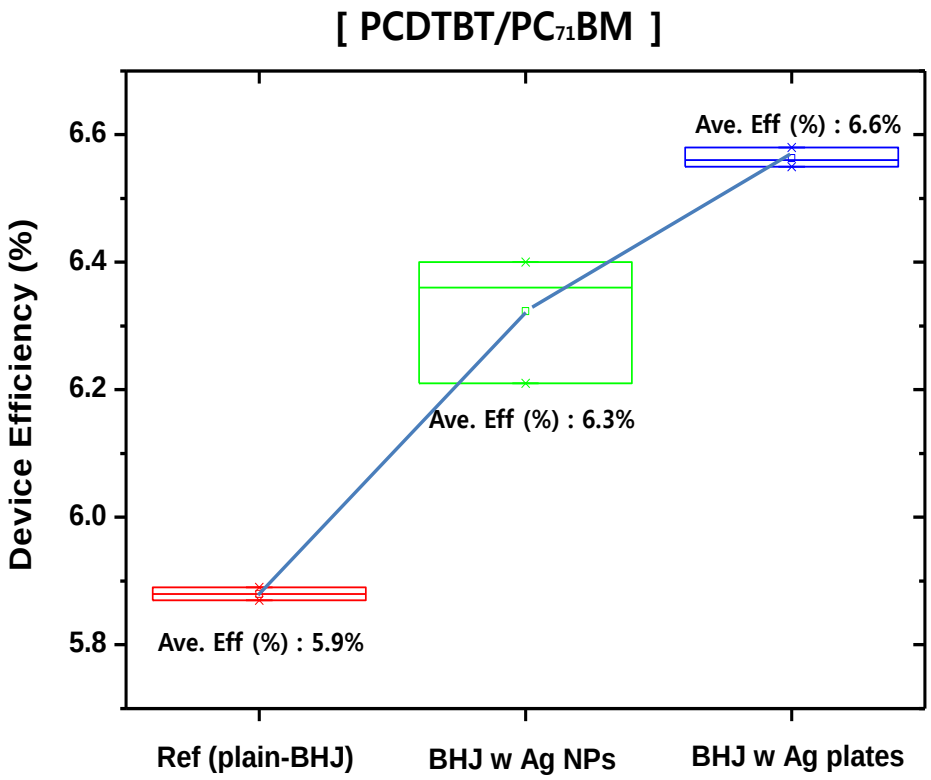

Figure S5. The average PCDTBT/$PC_{71}BM$ device efficiencies of plain BHJ (reference device), BHJ with Ag NPs, and BHJ with Ag nanoplates. The BHJ with Ag nanoplates (6.6 %) showed 11% increased average power conversion efficiency (more than ten samples were tested) than the plain-BHJ without Ag materials (5.9 %).

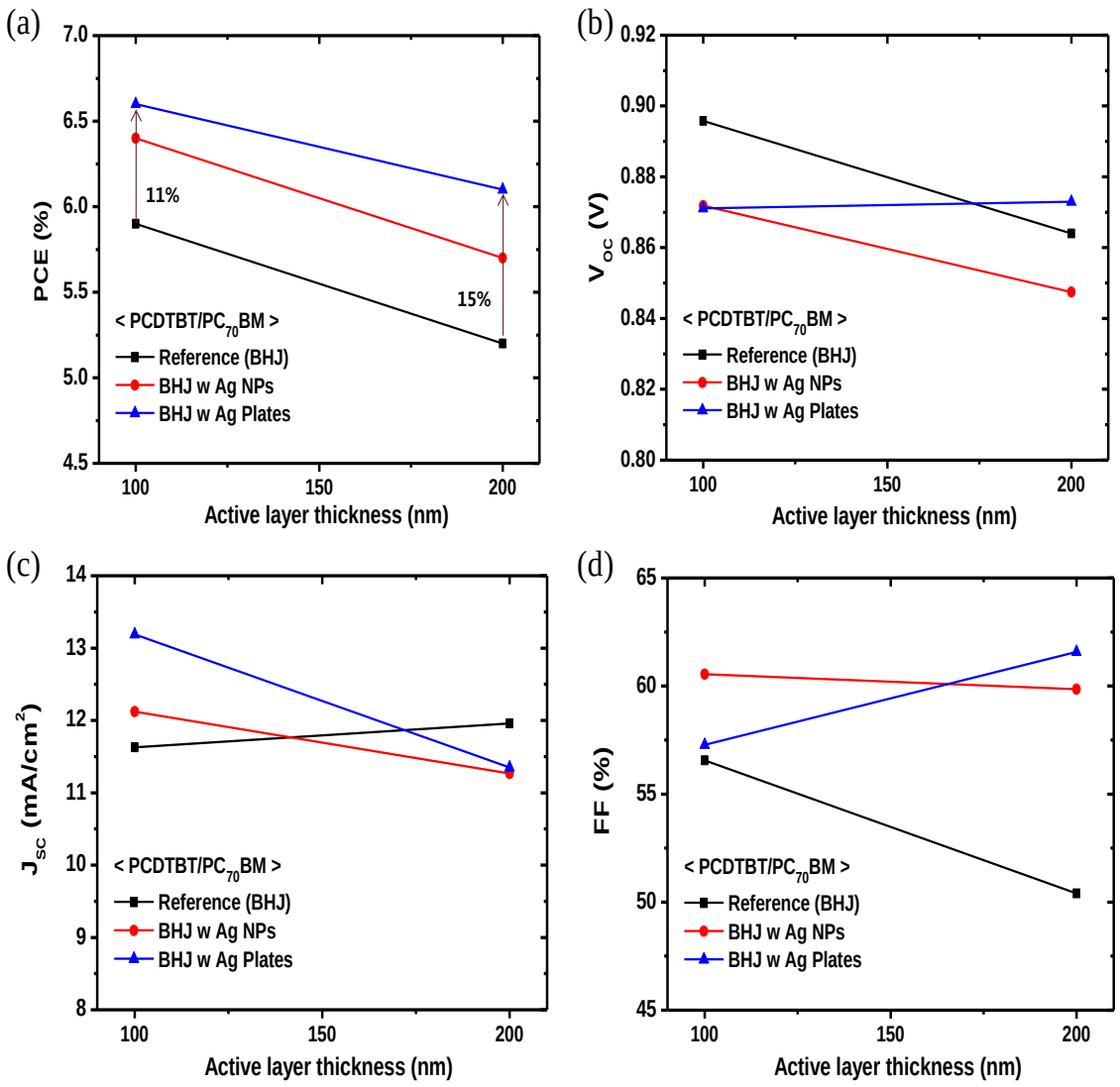

Figure S6. Results of the fabricated photovoltaic devices with the plain PCDTBT/$PC_{71}BM$ BHJ, the BHJ with Ag NPs, and the BHJ with Ag nanoplates as a function of the active layer thickness from 100 nm and 200 nm: (a) PCE (%), (b) V_{oc} (V), (c) J_{sc} (mA/cm^2), and (d) FF (%).

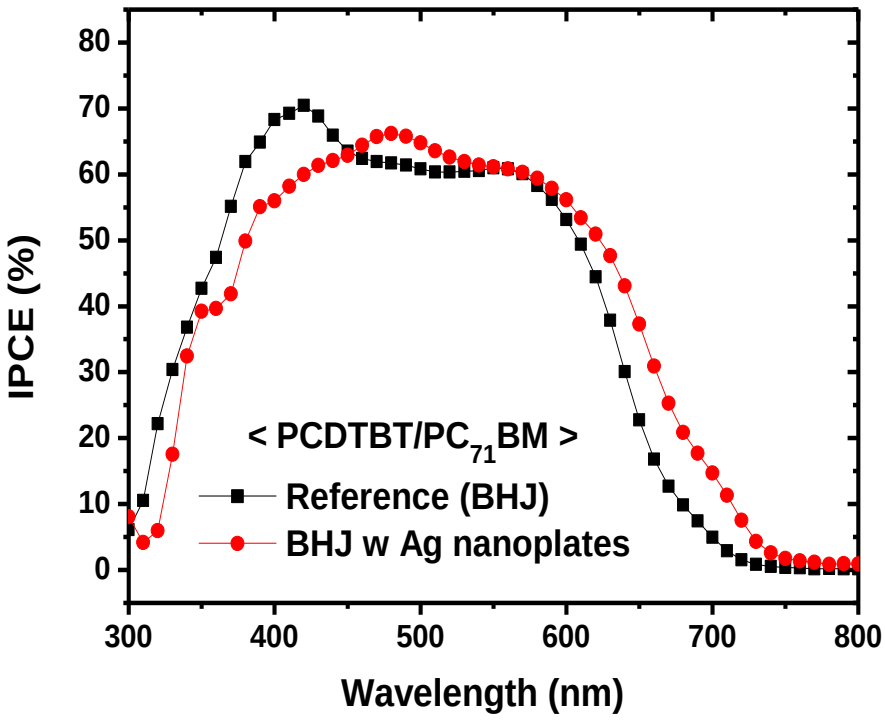

Figure S7. Incident photon to current efficiency (IPCE) spectra of the devices from PCDTBT/PC_{71}BM BHJ with and without Ag nanoplates.