Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Semiconducting Organic-Inorganic Nanocomposites by Intimately Tethering Conjugated Polymers to Inorganic Tetrapods

Jaehan Jung, *Young Jun Yoon*, and *Zhiqun Lin**

School of Materials Science and Engineering, Georgia Institute of Technology, Atlanta, GA 30332, USA

* To whom the correspondence should be addressed; Email: zhiqun.lin@mse.gatech.edu

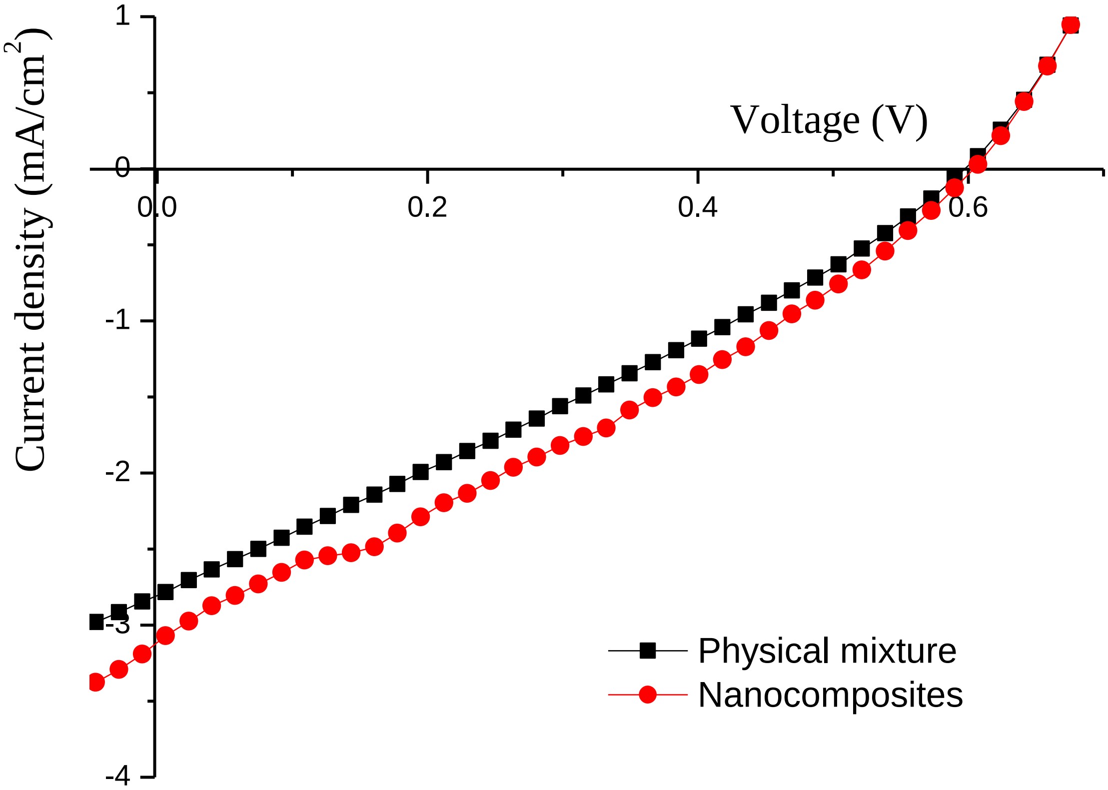

Figure S1. Current-voltage characteristics of hybrid solar cells composed of P3HT-CdSe tetrapod nanocomposites (red circles) and P3HT/CdSe tetrapods physical mixture (black squares). The weight fraction of CdSe tetrapods was 80% and the size of tetrapod was 16 nm. P3HT-CdSe tetrapod nanocomposites-based solar cell shows an improved *PCE* of 0.568% with a V_{oc} of 0.604 V, a J_{sc} of 3.07 mA/cm^2, a *FF* of 0.305 compared to the corresponding physical mixture (a *PCE* of 0.472% with a V_{oc} of 0.607 V, a J_{sc} of 2.78 mA/cm^2, a *FF* of 0.279). P3HT-CdSe tetrapod nanocomposites were synthesized using 4-azidobenzoic acid and P3HT/CdSe tetrapods physical mixture was prepared using butylamine-capped CdSe tetrapods via ligand exchange with pyridine.

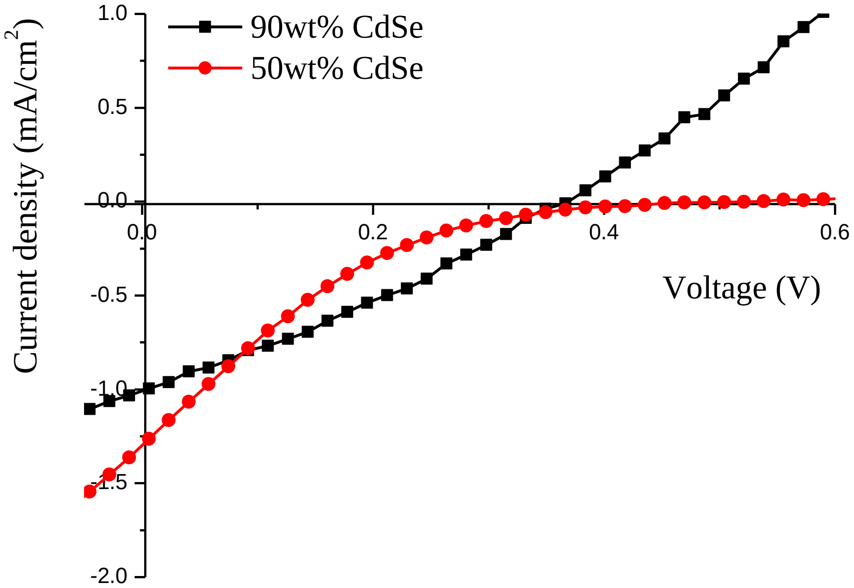

Figure S2. Current-voltage characteristics of hybrid solar cells composed of P3HT-CdSe tetrapod nanocomposites with the weight fraction of CdSe tetrapods of 50wt% and 90wt%, respectively, as the photoactive layer. Nanocomposites were synthesized by employing 4-azidobenzoic acid. The low performance of the device containing 50wt% CdSe tetrapods (a PCE of 0.077% with a J_{SC} of 1.26 mA/cm^2, a V_{OC} of 0.538V, and a *FF* of 0113) regardless of a smooth film (**Figure S3**) suggested the necessity of higher CdSe tetrapod weight fraction for enhanced device performance. Moreover, the devices fabricated using 90wt% CdSe tetrapods showed poor performance (a PCE of 0.1 % with a V_{OC} of 0.384V, a J_{SC} of 0.996 mA/cm^2, and a *FF* of 0.278) due to the large roughness of film (**Figure S3**).

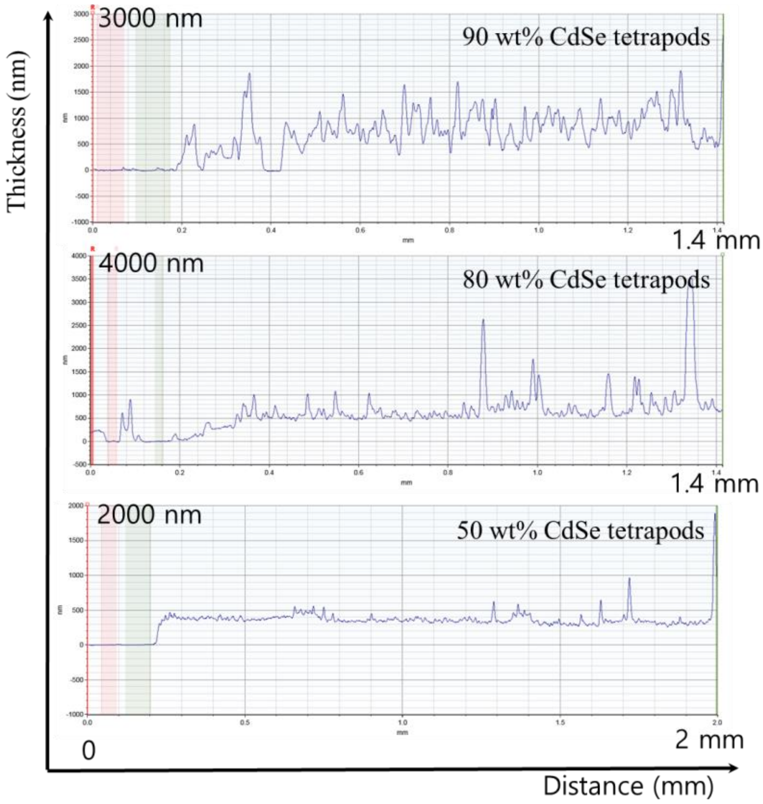

Figure S3. Height profiles of the films prepared using P3HT-CdSe tetrapod nanocomposites with the CdSe tetrapod weight fraction of 50%, 80%, and 90%, respectively, as measured by profilometer.