Electronic supplementary information

Wrinkle structure with broadband and omnidirectional light-trapping capabilities for improving performance of organic solar cell with low defect density

Kong Liu,*a,b Yang Sun,a,b Qicong Li,a,b Cheng Yang,a,b Muhammad Azam,a,b Zhijie Wang,a,b Shengchun Qu,a,b and Zhanguo Wanga,b

* Key Laboratory of Semiconductor Materials Science, Beijing Key Laboratory of Low Dimensional Semiconductor Materials and Devices, Institute of Semiconductors, Chinese Academy of Sciences, Beijing 100083, China.

b Center of Materials Science and Optoelectronics Engineering, University of Chinese Academy of Sciences, Beijing 100049, China.

Fig. S1 (a) Diameter and (b) edge distance distributions of AgNPs array.
Fig. S2 J-V characteristics of (a) wrinkled, (b) flat solar cells fabricated using different active layer spin-coating speed.

Fig. S3 Transmittance spectra of glass substrate, ITO film and MoO$_3$/Ag/ZnS transparent electrode.
Fig. S4 $J-V$ characteristics of solar cell based on flat ITO/glass substrate.

$J_{sc} = 16.87 \ \text{mA/cm}^2$

$V_{oc} = 0.89 \ \text{V}$

$FF = 67.83\%$

$PCE = 10.19\%$

Fig. S5 $J-V$ characteristics of (a) wrinkled and (b) flat solar cells under different incident angle.
Fig. S6 Surface SEM image of non-spherical AgNPs with sharp edge.

Fig. S7 J-V characteristics of solar cells based on (a) spherical and (b) non-spherical AgNPs array under various light intensities ranging from 100 mW cm$^{-2}$ to 10 mW cm$^{-2}$.