Electronic Supplementary Information (ESI) for

17.6%-efficient radial junction solar cells using silicon nano/micro hybrid structure

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SUPPORTING FIGURES

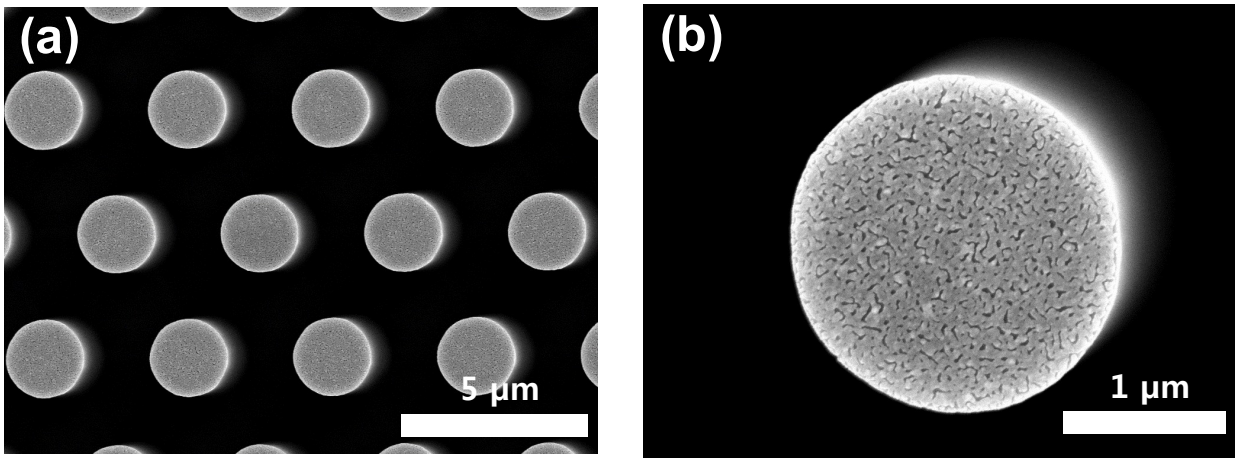

Fig. S1 (a) Low- and (b) high-magnification top-view SEM images of microwires with the 20-nm-thick Ag film on the top surfaces deposited at rates of 1 Å/s via thermal evaporation.

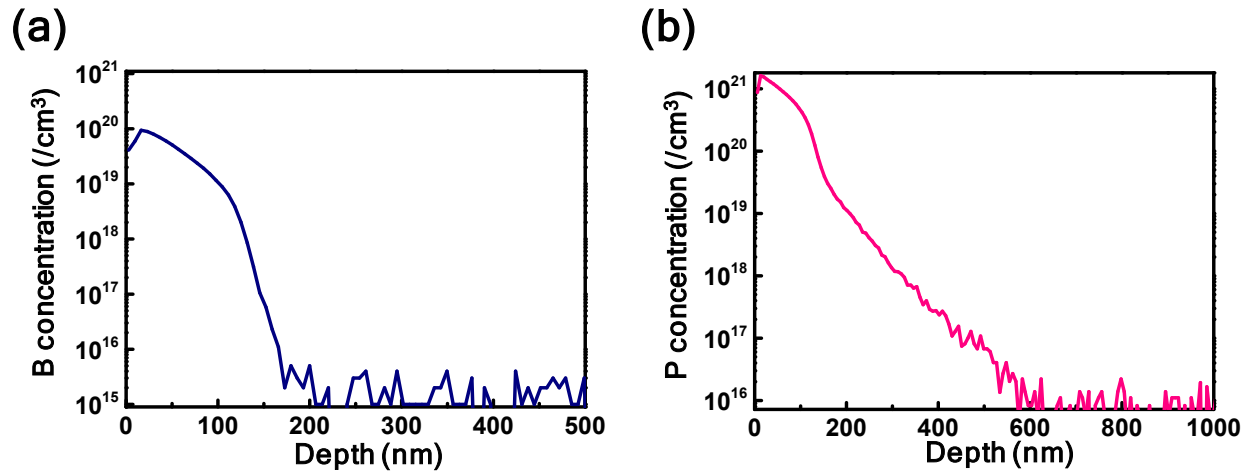

Fig. S2 Secondary ion mass spectrometry profiles of (a) emitter and (b) BSF regions.

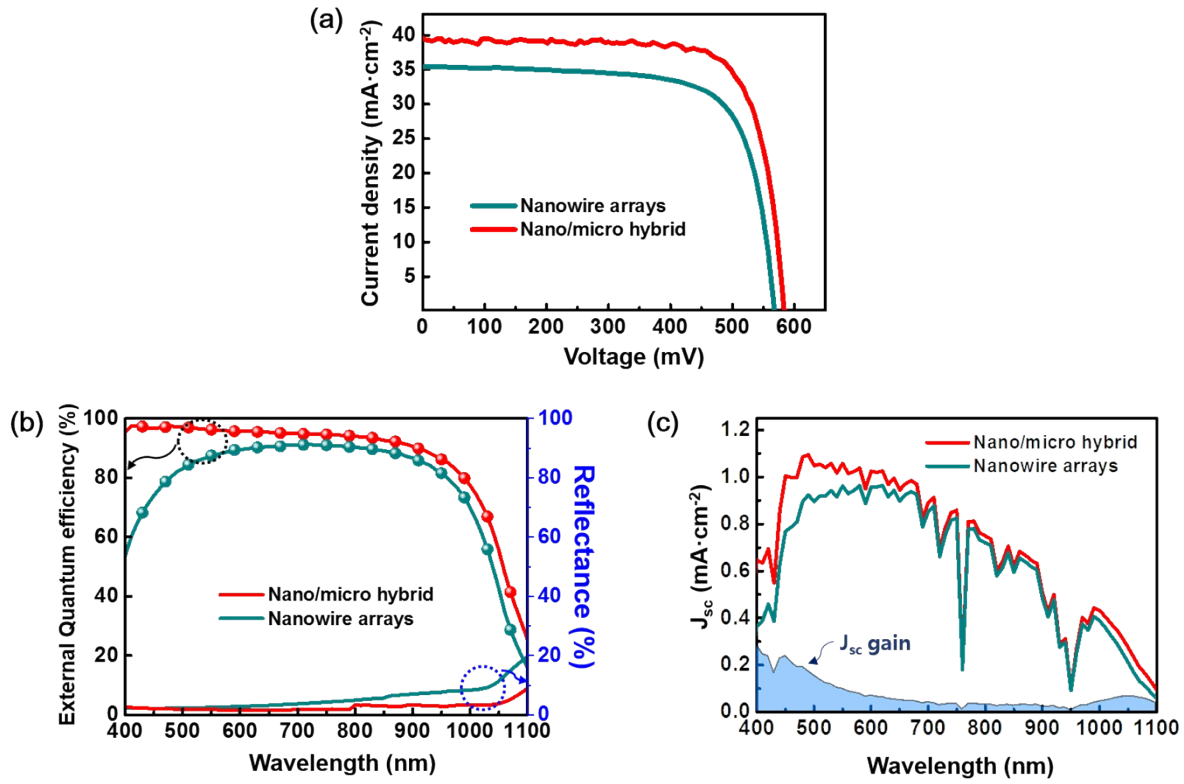

Fig. S3 (a) Current density–voltage characteristics of nanowires (green solid line), and nano/micro hybrid structure based solar cells (red solid line) under an illumination of AM 1.5G. (b) External quantum efficiencies of nanowires (green circle and line), and nano/micro hybrid structure based solar cells (red circle and line). Total reflectance spectra of nanowires (green solid line), and nano/micro hybrid structure (red solid line). (c) Integrated J_{sc} curves as a function of the wavelength for the nanowires (green solid line) and nano/micro hybrid structure (red solid line) solar cells obtained from the EQE results shown in panel b. The blue area denotes the J_{sc} gain by adopting the nano/micro hybrid structure. The integrated J_{sc} values in Fig. S3c are calculated using the following equation: $J_{sc} = \frac{q}{hc}\int S_s Q_x \lambda d\lambda$ where S_s is the AM 1.5G solar spectrum, Q_x is the EQE, λ is the light wavelength, q is the electron charge, h is Planck's constant, and c is the speed of light.

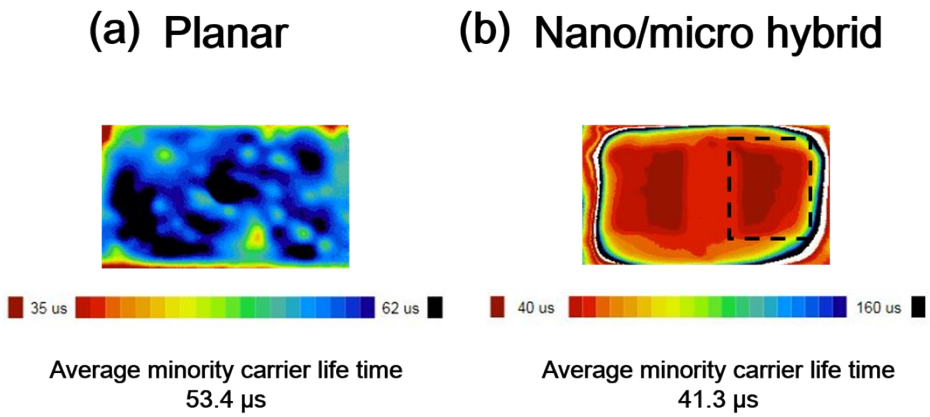

Fig. S4 Minority-carrier lifetime maps of (a) planar, and (b) nano/micro hybrid structure.

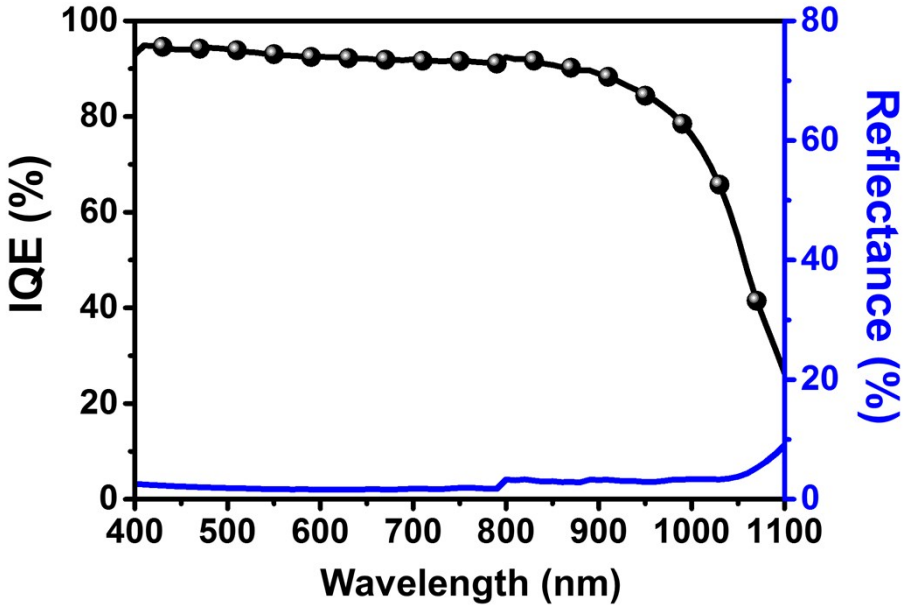

Fig. S5 Internal Quantum Efficiency (black solid line with circles) and reflectance spectra of nano/micro hybrid structure (blue solid line).

Table S1 Average photovoltaic performance of nanowire, and nano/micro hybrid structure-based solar cells.[a)] (Values in the brackets are obtained from the champion device.)

Device structure	**J_{sc} ($mA \cdot cm^{-2}$)**	**V_{oc} (mV)**	**FF (%)**	**E_{ff} (%)**
Nanowire arrays	35.0 (35.4)	561 (568)	73.4 (72.8)	14.4 (14.7)
Nano/micro hybrid	39.1 (39.5)	581 (584)	75.8 (76.1)	17.3 (17.6)

[a)] Average photovoltaic performance for 8 devices.