

Supporting Information

Power Conversion Efficiency Enhancement Based on the Bio-inspired Hierarchical Antireflection Layer in Dye Sensitized Solar Cell

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Fabrication of 2D Diffraction Grating in Polymer

The substrates were cleaned using ultra-sonication with acetone, isopropanol, and de-ionized water for 10 min and dried by nitrogen blowing. A 100 nm thick photoresist film was obtained by spin-coating at 3000rpm on a TiCl_4 treated FTO substrate. 2D square patterns with circular holes were fabricated via interference lithography. The samples were double exposed for 6 x 6s by rotating the sample 90 degrees. Before developing the photoresist using PGMEA, a post-exposure bake was conducted at 55 °C for 10min. The diameter and pitch of the patterns were found to be 380 nm and 550 nm, respectively, from SEM measurements.

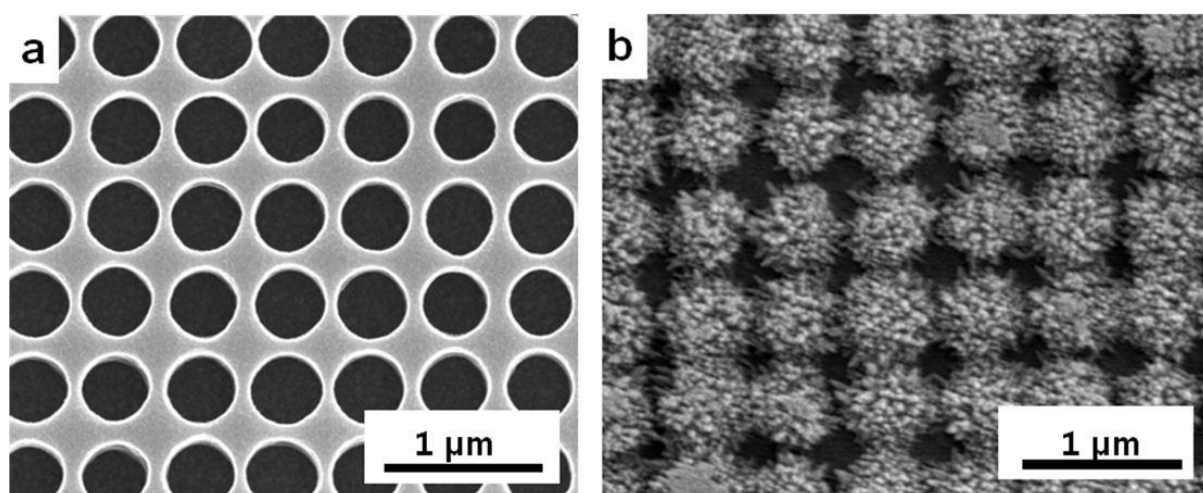


Figure S1: Low magnification SEM images of a) SU-8 pattern b) SU-8/ TiO_2 NWs grown on SU-8 template

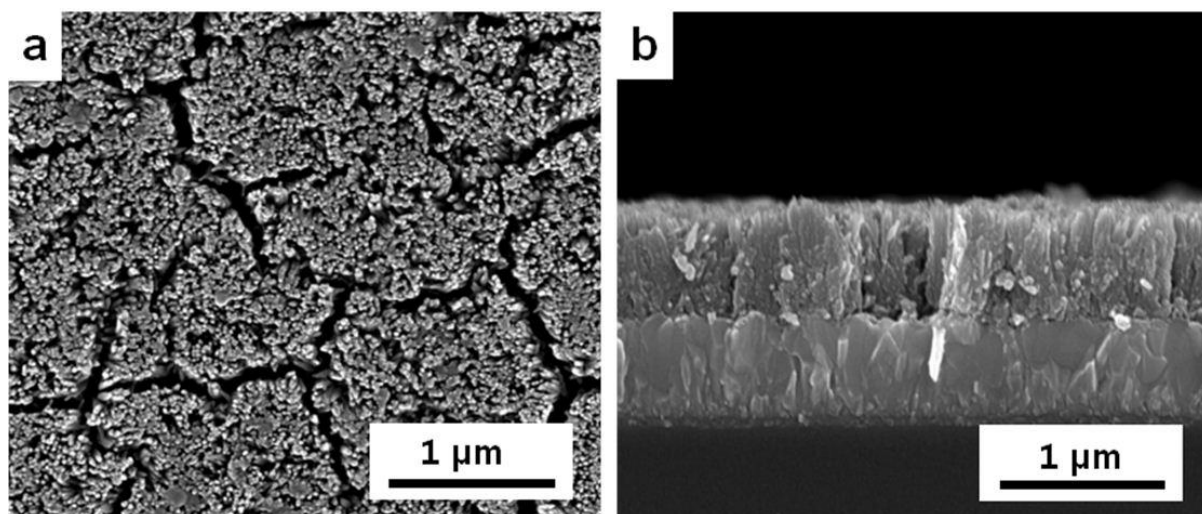


Figure S2. SEM images of a) TiO₂ NWs; b) Cross-sectional image of TiO₂ NWs

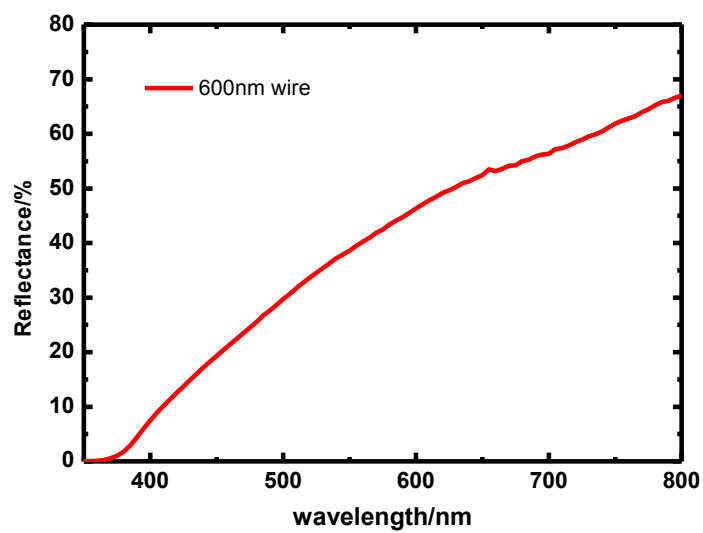


Figure S3. The reflectance of 600 nm TiO₂ NWs

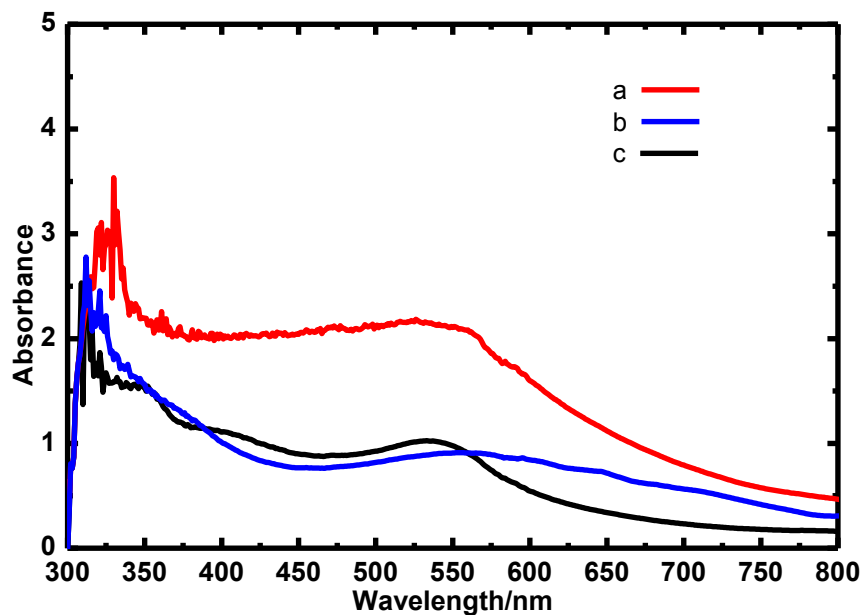


Figure S4. Absorbance spectra of TiO₂ NWs after N-719 dye absorption: a) 5.5 μm hybrid structure; b) 500 nm TiO₂ NWs; c) 5 μm NC-TiO₂ structure

Calculation of effective refractive index of AR layer

On the basis of the effective medium theory^{1, 2}, the effective refractive index n_{AR} can be approximated to be 1.967 by the equation

$$n_{AR} = [0.68 \times n_{TiO_2}^q + 0.32 \times n_{air}^q]^{1/q}, \text{ where } q = 2/3$$

and the volume ratio of TiO₂:air = 0.68:0.32 from the SEM image.

1. Li, H. Y.; Jiang, B.; Schaller, R.; Wu, J. F.; Jiao, J., Antireflective Photoanode Made of TiO₂ Nanobelts and a ZnO Nanowire Array. *Journal of Physical Chemistry C* 114, (26), 11375-11380.
2. Stavenga, D. G.; Foletti, S.; Palasantzas, G.; Arikawa, K., Light on the moth-eye corneal nipple array of butterflies. *Proceedings of the Royal Society B-Biological Sciences* **2006**, 273, (1587), 661-667.