Supplementary Information

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Supplementary Figure 1

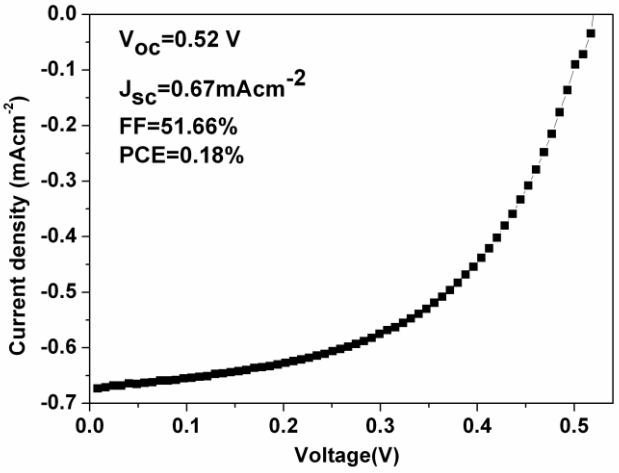


Fig S1 Photocurrent density –voltage (*J-V*) characteristic of device with the photoanode of CuPc/TiO_2 under AM1.5 (100mWcm^{-2})

Supplementary Figure 2

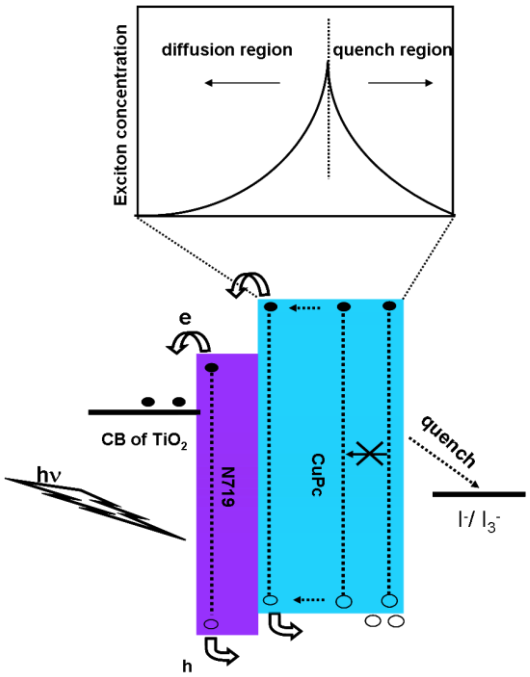


Fig.S2 Schematic of electrolyte (I_3^-) quenching the excited state of the CuPc and relationship between exciton concentration and distance from closer to N719 to far from N719

I_3^- in the electrolyte is a "prefect quencher", that quenches the excited state of CuPc thereby sacrificing the outmost shell of the CuPc layer. The schematic of exciton concentration distribution in CuPc also can be seen in Fig.S3. The left side, closer to N719, is the exciton diffusion region; while the right side, near to the interface between CuPc and electrolyte, is a quench region.

Supplementary Figure 3

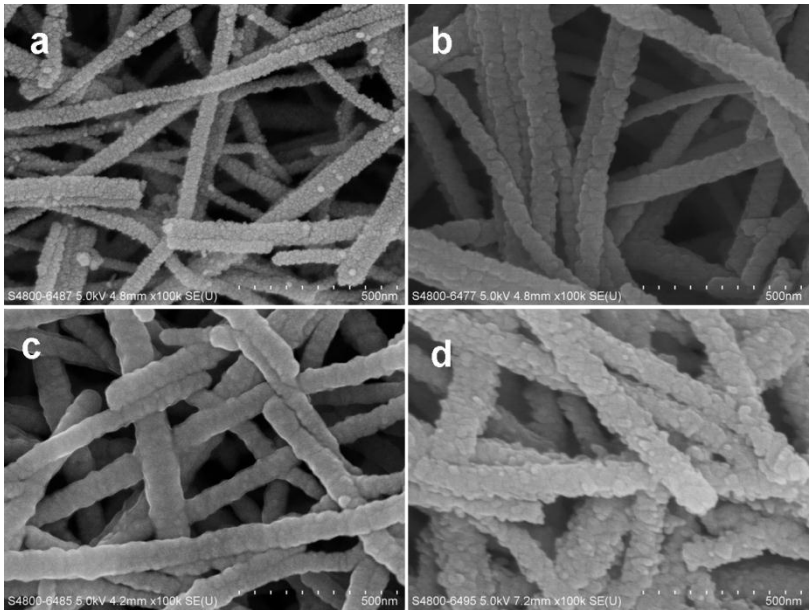


Fig S3 SEM images of N719-sensitized TiO_2 nanofibers coated with CuPC shell: a, without CuPc; b, 20nm CuPc; c, 30nm CuPc; d, 40nm CuPc

Fig S3 shows the SEM images of the N719-sensitized TiO_2 nanofibers coated with CuPc shell. Fig S3 a is a SEM image of N719-sensitized TiO_2 nanofiber; b, c, d represent deposition of 20-nm, 30-nm and 40-nm thick CuPc shell, respectively, on the N719-sensitized TiO_2 nanofibers.

Supplementary Figure 4

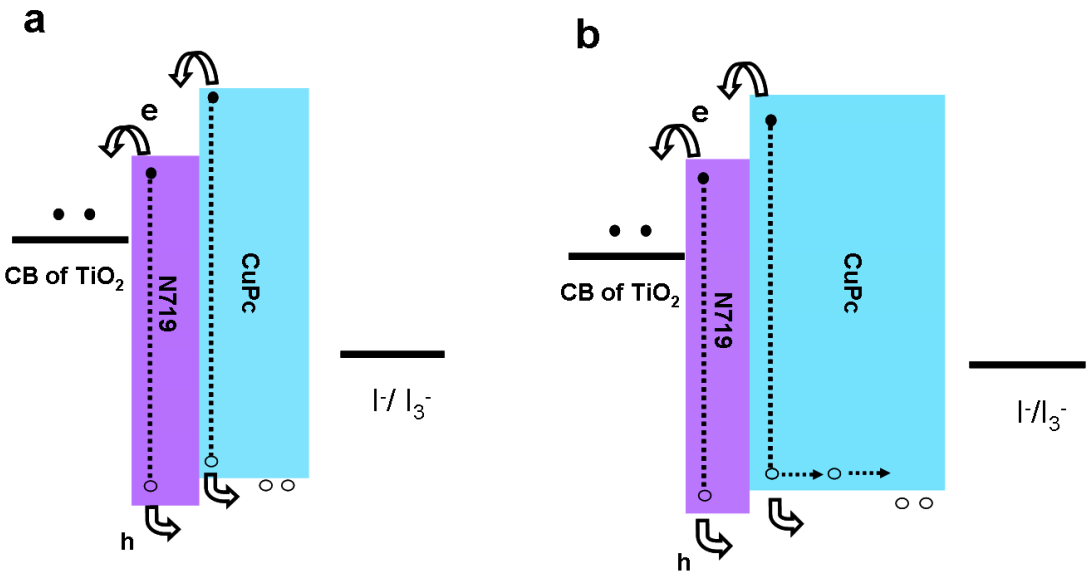
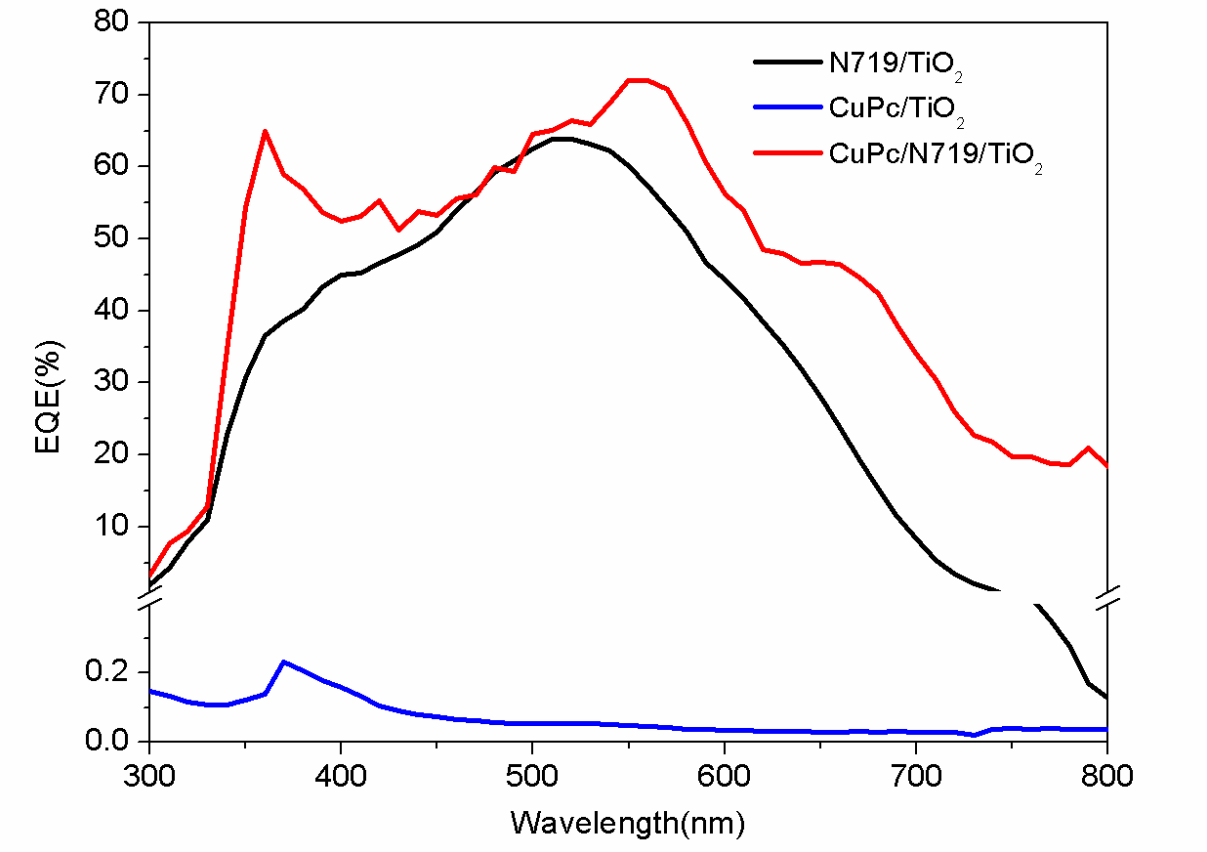


Fig S4 Schematics of holes transfer process in DSSC with core-shell photoanode: a with thinner CuPc shell; b, with thicker CuPc shell.

When the thickness of CuPc is comparable to its diffusion length, except the quenched excitons, the excitons diffuse to the interface of N719 and CuPc and subsequently dissociate. Electrons are injected into the LUMO of N719, and subsequently injected into the CB of TiO_2. Concurrently, the holes diffuse to the interface between CuPc and electrolyte. However, when the thickness of CuPc exceeds the sum of its exciton diffusion length and length of quench region, the excess CuPc thickness induces extra resistance that retards the regeneration of the N719 due to the inferior holes transport property.

Supplementary Figure 5



FigS5 EQE versus wavelength of the DSSC with and without 30nm CuPc