Hydroquinone redox mediator enhances the photovoltaic performance of chlorophyll-based bio-inspired solar cell

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**Figure S1.** The band shape and lifetime of the triplet-species of Chl-A film blended with HQ pumped at 737 nm.

**Figure S2.** The band shape and lifetime of the triplet Chl-D film blended with HQ pumped at 727 nm.
**Figure S3.** The influence of the film thickness of Chl-A and Chl-D to the final photovoltaic performance of the Z-scheme photosynthesis inspired devices.

**Figure S4.** The Photovoltaic performances of the device when the HQ is blended to Chl-A and/or Chl-D with a molar ratio of 1:1, which is the same as the TAS measurement of the film samples.

**Table S1.** Photovoltaic performances of the Chl-derivatives based bio-solar cells when HQ is blended to Chl-A or/and Chl-D with a molar ratio of 1:1.

| Device types  | $J_{sc}$ (mA∙cm$^{-2}$) | $V_{oc}$ (V) | FF  | PCE (%) |
|---------------|-------------------------|--------------|-----|---------|
| Pristine device | 5.07                    | 0.58         | 0.40| 1.18    |
| Chl-A:HQ=1:1   | 4.96                    | 0.51         | 0.36| 0.91    |
| Chl-D:HQ=1:1   | 2.63                    | 0.44         | 0.40| 0.46    |
| Both blended as 1:1 | 2.18                   | 0.42         | 0.40| 0.37    |
Figure S5. The $J$-$V$ curves of different ratios of HQ doped Chl-D layer-based devices.

Table S2. The photovoltaic performances of the HQ doped Chl-D layer-based bio-solar cells.

| Device types | $J_{sc}$ (mA·cm$^{-2}$) | $V_{oc}$ (V) | FF  | PCE (%) |
|--------------|--------------------------|--------------|-----|---------|
| 0% HQ        | 5.45                     | 0.56         | 0.41| 1.25    |
| 0.1% HQ      | 5.31                     | 0.50         | 0.42| 1.11    |
| 0.5% HQ      | 4.74                     | 0.47         | 0.41| 0.91    |
| 1% HQ        | 3.93                     | 0.47         | 0.40| 0.74    |
Figure S6. The photovoltaic performance of the 0.5% HQ doped device under forward and backward scan direction.