Electronic supplementary information

Solid reaction towards in-situ hybridization of carbon dots and conjugated polymer for enhanced light absorption and conversion

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1. Sample characterizations

Fluorescence spectroscopy and absorption were collected on a Hitachi F4500 fluorescence spectrophotometer and a Shimadzu UV-2550 UV-vis spectrometer, respectively. Scanning electron microscope (SEM) were performed on a Hitachi S-4800 scanning electron microscope. The X-ray diffraction (XRD) patterns of the materials were recorded on a Rigaku D/Max 2550 X-ray diffractometer with Cu Kα radiation. The Raman spectra of the materials were collected by a Renishaw Raman system model 1000 spectrometer with a 20 mW air-cooled argon ion laser (514.5 nm) as the exciting source. The sample suspension was dropped onto copper grids covered with an amorphous carbon film to prepare specimen for transmission electron microscopy (TEM) observation which were performed in a FEI Tecnai G2 F20 microscope with a field-emission gun operating at 200 kV. X-ray photoelectron spectroscopy (XPS) data of all samples was collected by a Kratos AXIS 165 mutitechnique electron spectrometer having an Al Kα X-ray source for determining the composition and chemical bonding configurations.

Photocatalytic activity measurements were performed according to the report of Ghosh et al.

Sample electrodes for electrochemical analysis were prepared by drop-casting sample EtOH suspensions onto a cleaned indium tin oxide (ITO) glass. We subjected the sample electrodes to electrochemical analysis in 1 M Na₂SO₄ solution with a Pt foil counter and an Ag/AgCl (3 M KCl) reference. Mott–Schottky plots were recorded on an electrochemical workstation (Bio-logic, SP 120) by using the Impedance-
Potential technique. In the same electrochemical system, a linear potential scan was conducted at 5 mV/s.

2. Supporting results

Figure S1 Photos of samples S1-S3, respectively.
Figure S2 ATR–FTIR spectrum of PDPB nanostructures copied from Ref. [Nat. Mater., 2015, 14, 505-511]
Figure S3 (a) deconvoluted C1s spectrum of S3; (b-d) deconvoluted O1s spectra of S1, S2 and S3, respectively.

Table S1 Percentage of C and O atoms in S1-S3, respectively, as determined by XPS measurements

<table>
<thead>
<tr>
<th>Sample</th>
<th>C (%)</th>
<th>O (%)</th>
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<tbody>
<tr>
<td>S1</td>
<td>96.65</td>
<td>3.35</td>
</tr>
<tr>
<td>S2</td>
<td>91.16</td>
<td>8.84</td>
</tr>
<tr>
<td>S3</td>
<td>82.97</td>
<td>17.03</td>
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</tbody>
</table>
Figure S4 Raman spectra of S1-S3.
Figure S5 (a) XRD pattern of S1-S3; (b) XRD pattern of solid PDPB nanostructure and bulk PDPB copied from Ref. [Nat. Mater., 2015, 14, 505-511]
Figure S6 Linear potential scans for samples of S1-S3.