Supplementary Information

FTO-free counter electrodes for dye-sensitized solar cells using carbon nanosheets from a polymeric carbon source

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Fig. S1. The reaction mechanism of the preparation of CNS-CE using PAN as the precursor; (a) structure of PAN, (b) the structure of oxidized PAN, (c-e) the reaction during carbonization [1].
**Fig. S2.** AFM images of CNS-CEs carbonized at various conditions. All the samples showed similar root mean square roughness.
**Fig. S3.** Deconvoluted version Raman spectra of CNSs prepared at a range of carbonization temperatures.
Fig. e S4. The UPS analysis results of CNS-CEs prepared at various carbonization temperatures.
Fig. S5. The XPS spectra of various CNSs; (a) 800 °C, (b) 900 °C, (c) 1000 °C, (d) 1100 °C, (e) 1200 °C. The detailed indications for the deconvoluted peaks are shown in (c).
Table S1. Atomic composition of various CNSs obtained from XPS spectra.

<table>
<thead>
<tr>
<th>CNS sample</th>
<th>C (atomic%)</th>
<th>O (atomic%)</th>
<th>N (atomic%)</th>
</tr>
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<tbody>
<tr>
<td>CNS-800</td>
<td>81.81</td>
<td>11.17</td>
<td>7.01</td>
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<tr>
<td>CNS-900</td>
<td>85.66</td>
<td>9.53</td>
<td>4.81</td>
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<td>CNS-1000</td>
<td>91.57</td>
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<td>CNS-1100</td>
<td>93.08</td>
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<td>CNS-1200</td>
<td>94.46</td>
<td>3.35</td>
<td>2.19</td>
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Reference