Supporting Data

**Figure A.1.** (A) Anodic etching processes for obtaining etched-Si with frameworks in ultranano scale. (B) The top view of etched-Si flakes (C) The bottom view of etched-Si flakes.
Figure A.2. (A) The full XPS spectrum of SiUPs. (B) The high-resolution scanning spectra of O 1s core-level XPS SiUPs.
Figure A.3. (A) Optical images of SiUPs, r-Si, and c-Si. (B) The high-resolution O 1s XPS spectrum of SiUPs.
Figure A.4. TEM images of TD-SiUPs-31 and m-SiUPs

A

TD-SiUPs-31

SiUPs nanoclusters

500 nm

TD-SiUPs-31

SiUPs nanoclusters

250 nm

B

m-SiUPs

SiUPs clusters

500 nm

m-SiUPs

SiUPs clusters

50 nm
Figure A.5. Low-magnification SEM images of TD-SiUPs-31 and m-SiUPs.
Figure A.6. BET analysis of TD-SiUPs-31 and m-SiUPs.
Figure A.7. (A) Cycling performance of graphitic flakes at two current densities of 0.2 and 0.8 A g$^{-1}$ for 100 cycles. (B) The rate performance of graphitic flakes at different current densities.
Figure A.8. Exhibited Coulombic efficiency of (A) TD-SiUPs-11 and (B) TD-SiUPs-23.
**Table A.1.** The summary of characteristics for SiUPs, c-SiNPs, and r-SiNPs.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Diameters [nm]</th>
<th>100\textsuperscript{th} cycle discharged capacity [mAh g\textsuperscript{-1}]</th>
<th>Capacity retention after 100 cycles [%]</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiUPs</td>
<td>&lt;10</td>
<td>602.3</td>
<td>19.94</td>
<td>Low</td>
</tr>
<tr>
<td>c-SiNPs</td>
<td>40–200</td>
<td>31.2</td>
<td>1.02</td>
<td>High</td>
</tr>
<tr>
<td>r-SiNPs</td>
<td>50–1000</td>
<td>18.7</td>
<td>0.74</td>
<td>Low</td>
</tr>
</tbody>
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