Supporting information

Template-free synthesis of 3D anatase TiO$_2$ hierarchical architectures with enhanced photocatalytic activity

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Figure S1 HRTEM images of nanoleaves of flower-like anatase TiO$_2$ assembly.
Figure S2 HRTEM images of nanoleaf TiO$_2$.
Figure S3 TEM images of the spindle shaped TiO$_2$ mesocrystal, which was synthesized under a TTIP concentration of 0.15 M.
Figure S4 XRD patterns of the products after various reaction periods, using TTIP and HAC as original reactants.
Figure S5 TEM images of FAT-160, the precipitate obtained after mixture of TTIP and HAC (a), the corresponding pattern of SAED (b), solvthermally treated for 12 h (c), and the corresponding SAED (d).
Figure S6 the SEM images of the flower-like TiO$_2$ 3D structures: (a-c) as-synthesized materials, and (d-e) the products originated from the as-synthesized materials calcined at 500 ºC.
Figure S7 SEM image of a single FAT-180 assembly, which obviously shows the composed flake shaped leaves.
Figure S8 SEM image of a broken flower-like assembly, which clearly exhibits subunits of the flake shaped leaves.
Figure S9 SEM images of the flower-like as synthesized products hydrothermal treated at 160 ºC in deionized water.
Figure S10 Morphology of the products synthesized at higher concentration (0.10 M< $C_{TTIP}$ < 0.40 M) of TTIP in acetic acid.
Figure S11 TEM (a) and HRTEM images of spindle shaped assemblies (b), and N$_2$ adsorption/desorption isotherms of spindle shaped nanoporous TiO$_2$ mesocrystals (c).
Figure S12 TEM images of various photocatalysts with hierarchical architectures load with 1wt% Pt as cocatalyst. (a-b) flower-like TiO$_2$, (c-d) spindle shaped TiO$_2$, and (e-f) irregular shaped TiO$_2$ nanoparticles.
Figure S13 Hydroxylation of TA (Terephthalic acid), using various TiO$_2$ photocatalysts in aqueous suspension.
Figure S14 HRTEM images of the FAT-400, FAT-500, and FAT-600.
Figure S15 TEM images of the ground FAT-500 loaded with 1% Pt.
Figure S16 Photocatalytic hydrogen evolution performed on the ground FAT-500 compared with that of FAT-500 loaded with 1% Pt, respectively.
Table S1 Crystallite size of the TiO$_2$ nanoparticles obtained at various temperatures
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<table>
<thead>
<tr>
<th>Sample</th>
<th>FAT-160</th>
<th>FAT-400</th>
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<th>FAT-600</th>
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<tr>
<td>Temperature (°C)</td>
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<td>600</td>
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<td>Crystallite size (nm)</td>
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