

Supporting information

**Template-free synthesis of 3D anatase TiO₂ hierarchical architectures
with enhanced photocatalytic activity**

Qifeng Chen^{*a,b}, Chuncheng Chen^b, Hongwei Ji^b, Wanhong Ma^b, Jincui Zhao^{*b}

- Figure S1 HRTEM images of nanoleaves of flower-like anatase TiO₂ assembly.
- Figure S2 HRTEM images of nanoleaf TiO₂.
- Figure S3 TEM images of the spindle shaped TiO₂ 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), solvothermally treated for 12 h (c), and the corresponding SAED (d).
- Figure S6 the SEM images of the flower-like TiO₂ 3D structures: (a-c) as-synthesized materials, and (d-e) the products originated from the as-synthesized materials calcined at 500 °C.
- 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 °C in deionized water.
- Figure S10 Morphology of the products synthesized at higher concentration ($0.10 \text{ M} < C_{\text{TTIP}} < 0.40 \text{ M}$) of TTIP in acetic acid.
- Figure S11 TEM (a) and HRTEM images of spindle shaped assemblies (b), and N₂ adsorption/desorption isotherms of spindle shaped nanoporous TiO₂ mesocrystals (c).
- Figure S12 TEM images of various photocatalysts with hierarchical architectures load with 1wt% Pt as cocatalyst. (a-b) flower-like TiO₂, (c-d) spindle shaped TiO₂, and (e-f) irregular shaped TiO₂ nanoparticles.
- Figure S13 Hydroxylation of TA (Terephthalic acid), using various TiO₂ 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 TiO₂ nanoparticles obtained at various temperatures

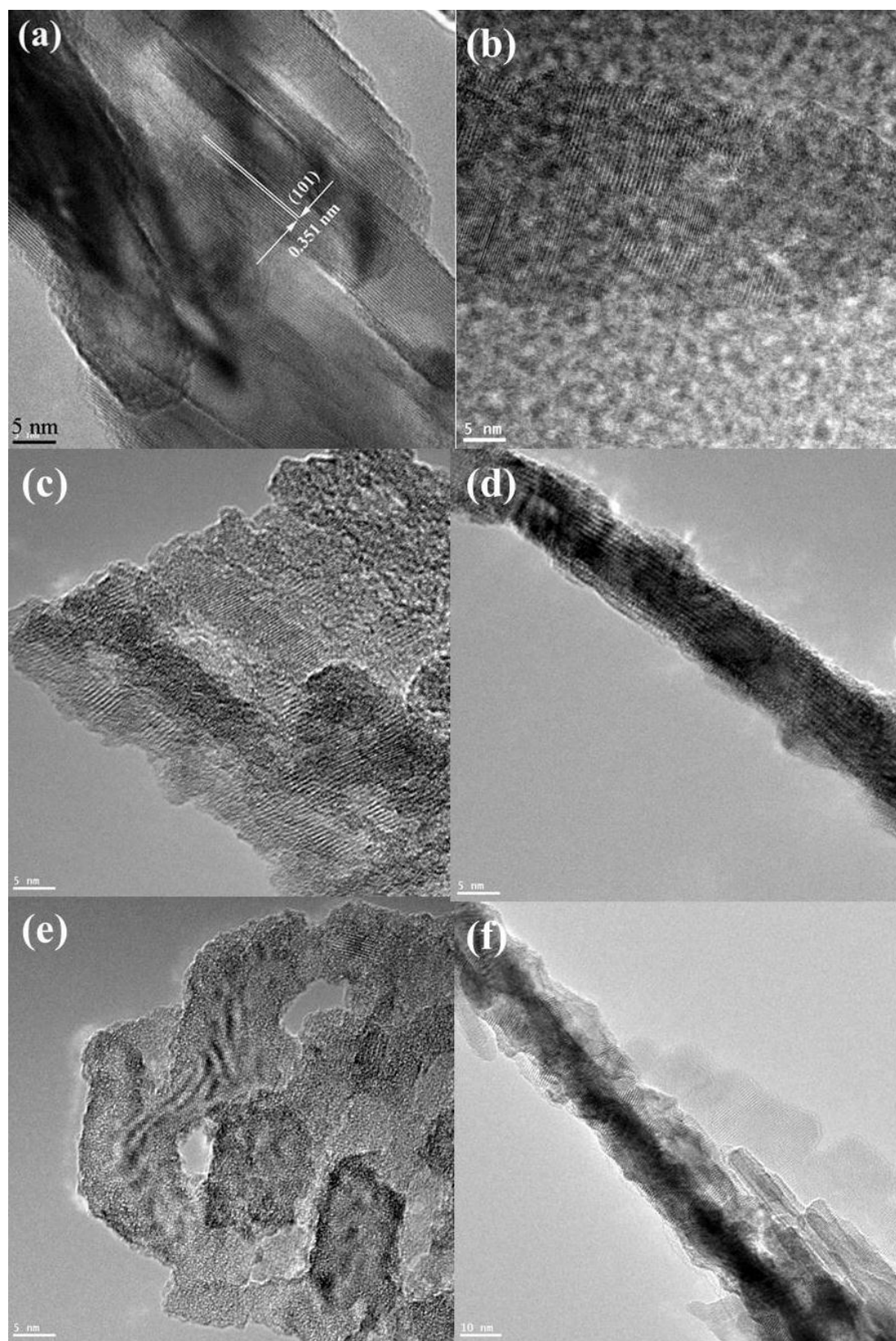


Figure S1 HRTEM images of nanoleaves of flower-like anatase TiO₂ assembly.

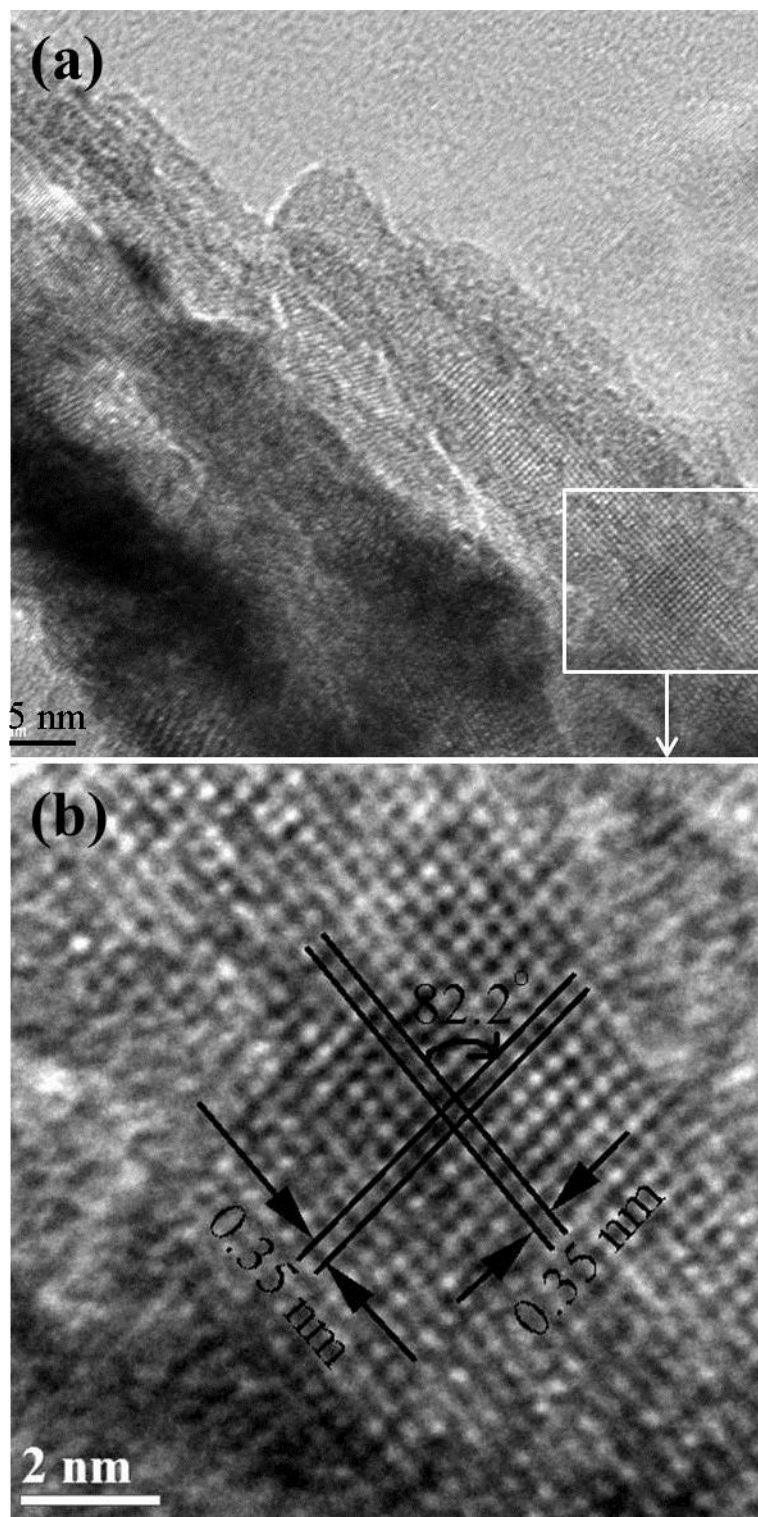


Figure S2 HRTEM images of nanoleaf TiO_2 .

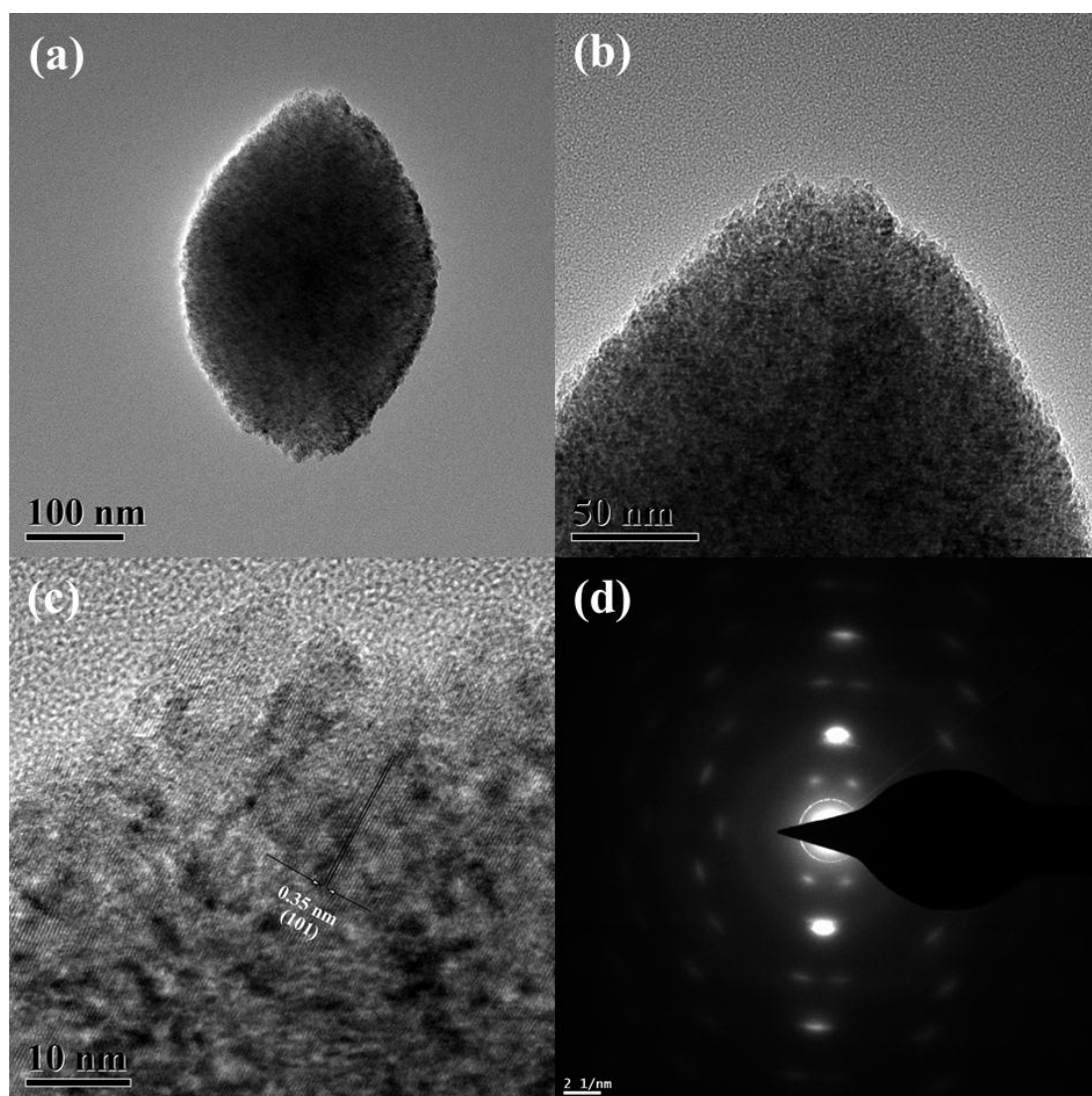


Figure S3 TEM images of the spindle shaped TiO_2 mesocrystal, which was synthesized under a TTIP concentration of 0.15 M.

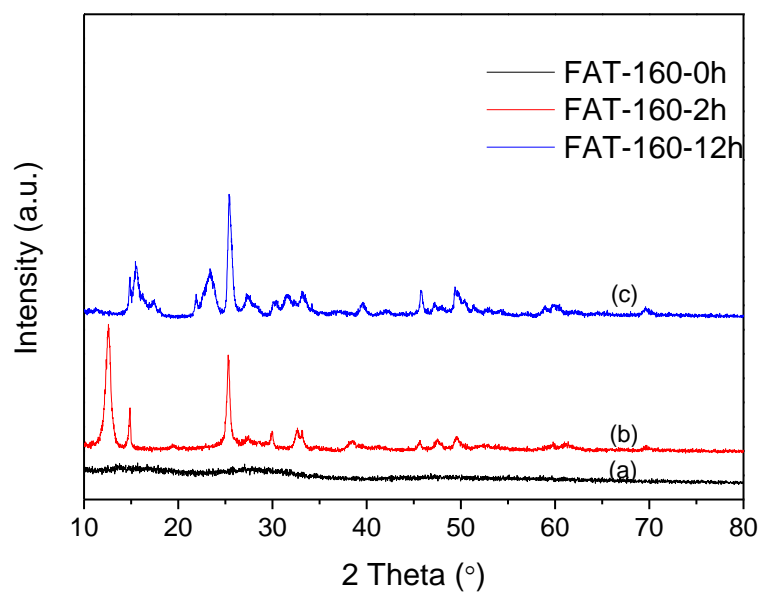


Figure S4 XRD patterns of the products after various reaction periods, using TTIP and HAC as original reactants.

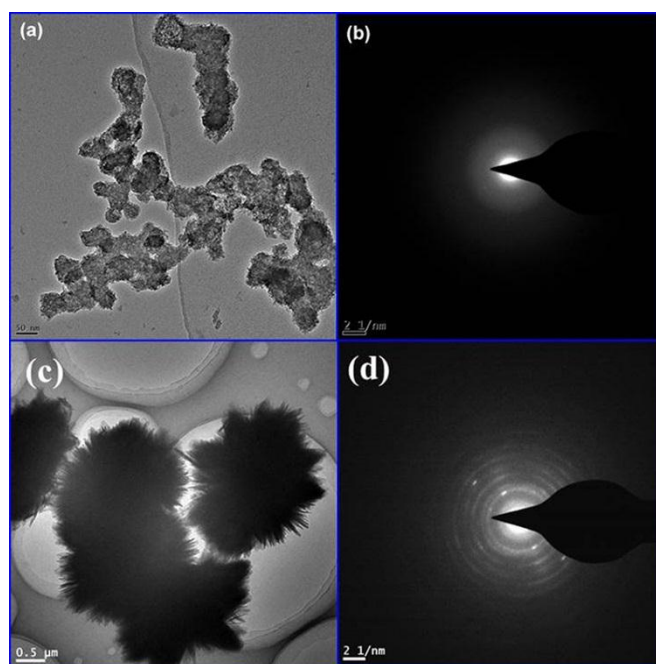


Figure S5 TEM images of FAT-160, the precipitate obtained after mixture of TTIP and HAC (a), the corresponding pattern of SAED (b), solvothermally treated for 12 h (c), and the corresponding SAED (d).

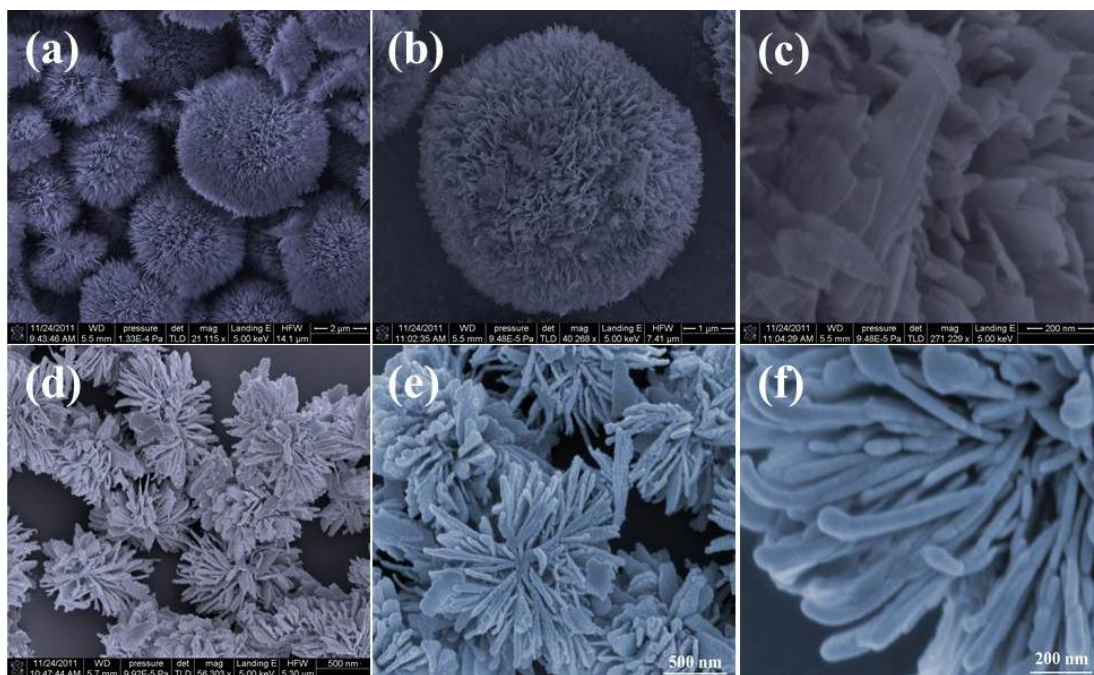


Figure S6 the SEM images of the flower-like TiO_2 3D structures: (a-c) as-synthesized materials, and (d-e) the products originated from the as-synthesized materials calcined at 500 °C.

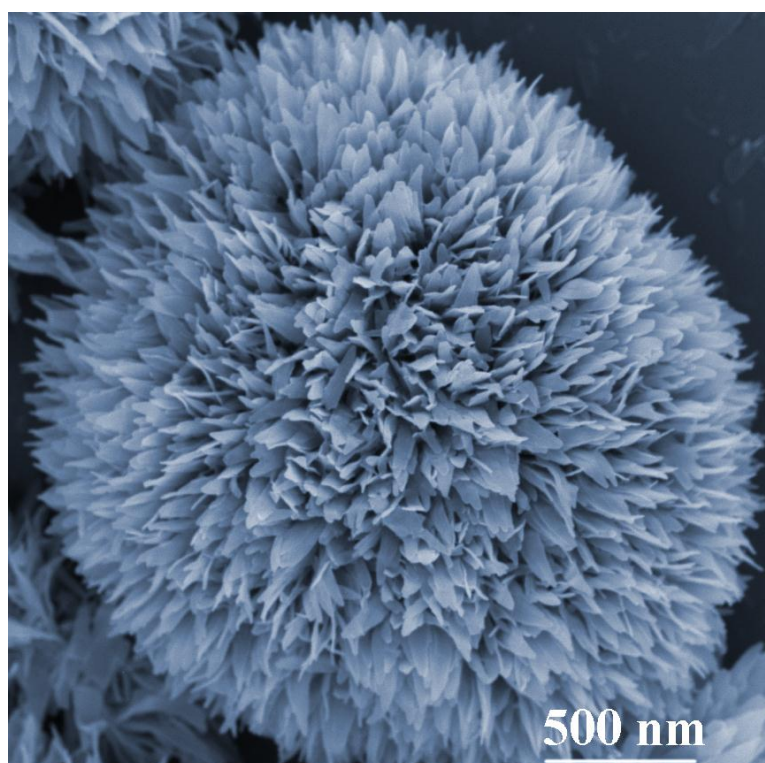


Figure S7 SEM image of a single FAT-180 assembly, which obviously shows the composed flake shaped leaves.

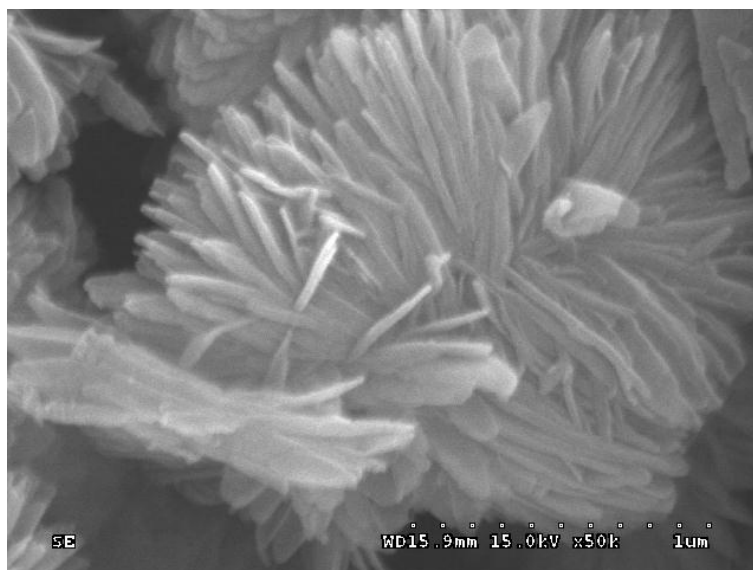


Figure S8 SEM image of a broken flower-like assembly, which clearly exhibits subunits of the flake shaped leaves.

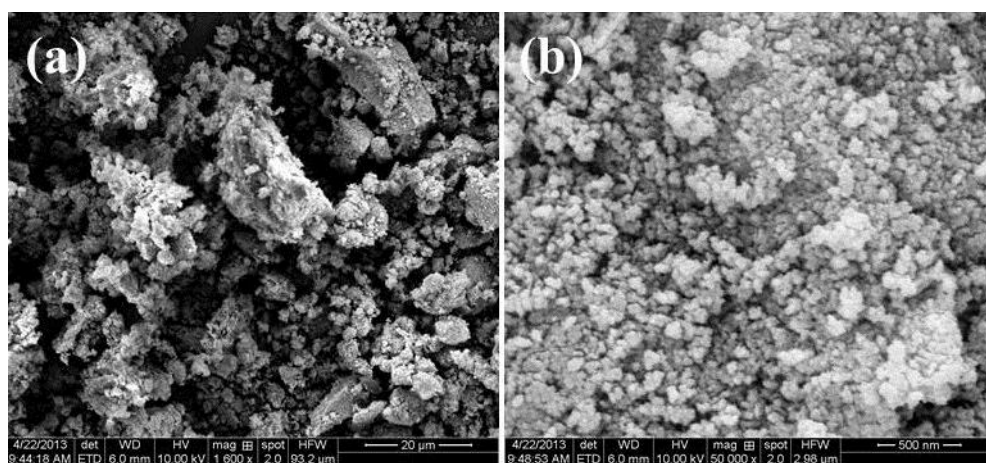


Figure S9 SEM images of the flower-like as synthesized products hydrothermally treated at 160 °C in deionized water.

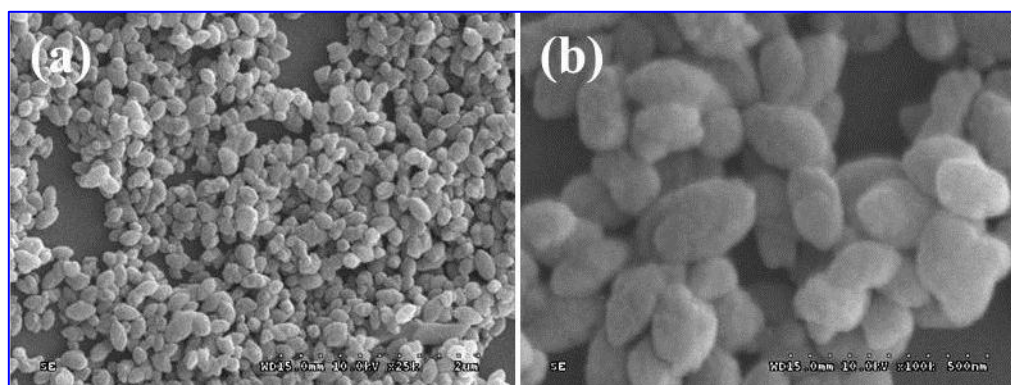


Figure S10 Morphology of the products synthesized at higher concentration ($0.10 \text{ M} < C_{\text{TTIP}} < 0.40 \text{ M}$) of TTIP in acetic acid.

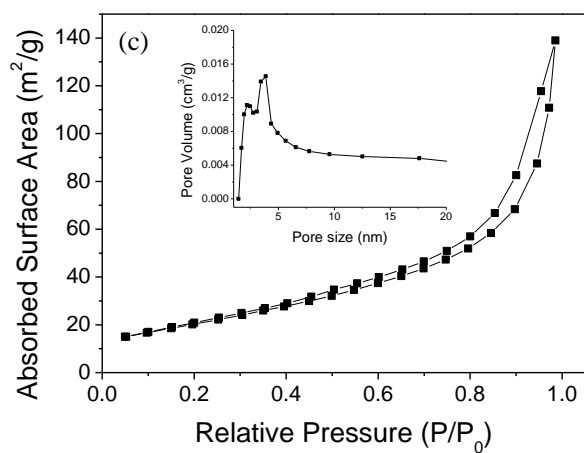
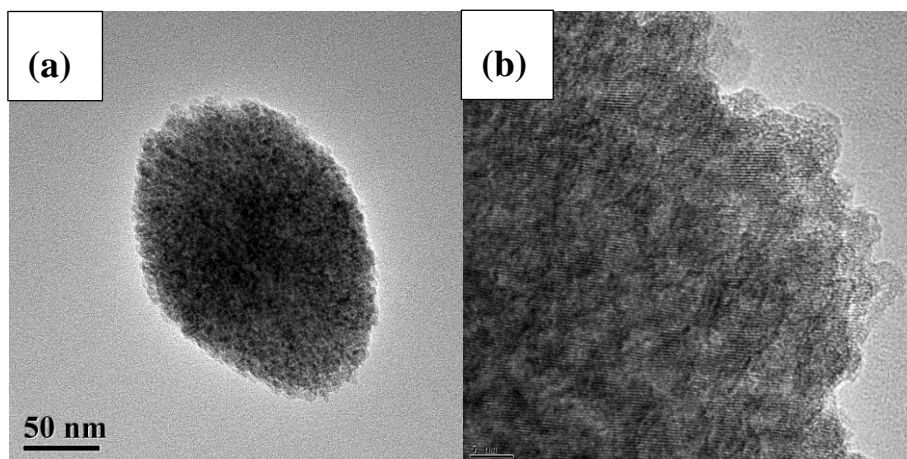


Figure S11 TEM (a) and HRTEM images of spindle shaped assemblies (b), and N₂ adsorption/desorption isotherms of spindle shaped nanoporous TiO₂ mesocrystals (c).

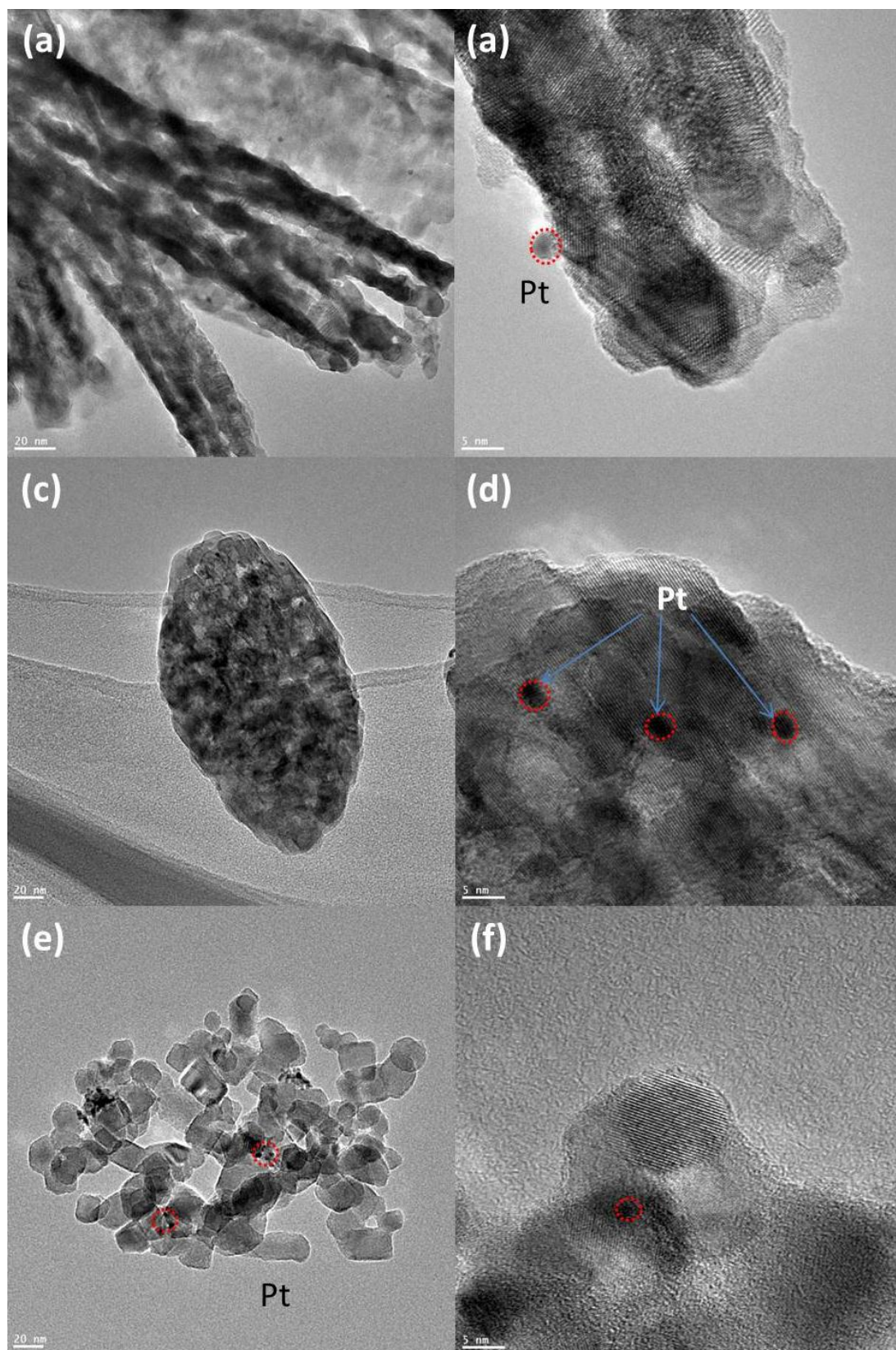


Figure S12 TEM images of various photocatalysts with hierarchical architectures load with 1wt% Pt as cocatalyst. (a-b) flower-like TiO_2 , (c-d) spindle shaped TiO_2 , and (e-f) irregular shaped TiO_2 nanoparticles.

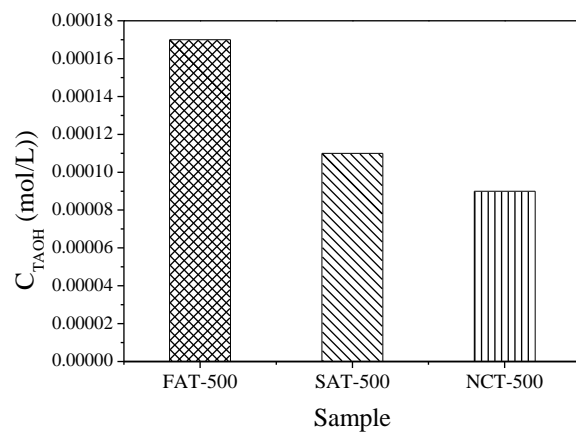


Figure S13 Hydroxylation of TA (Terephthalic acid), using various TiO_2 photocatalysts in aqueous suspension.

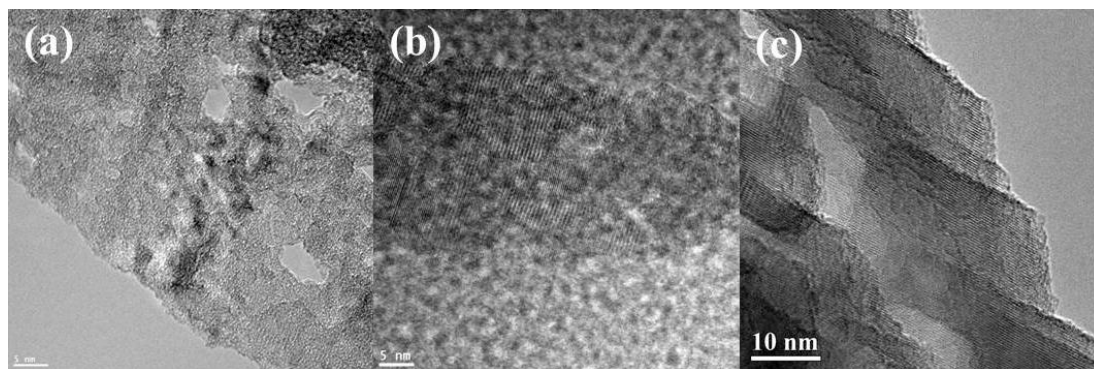


Figure S14 HRTEM images of the FAT-400, FAT-500, and FAT-600.

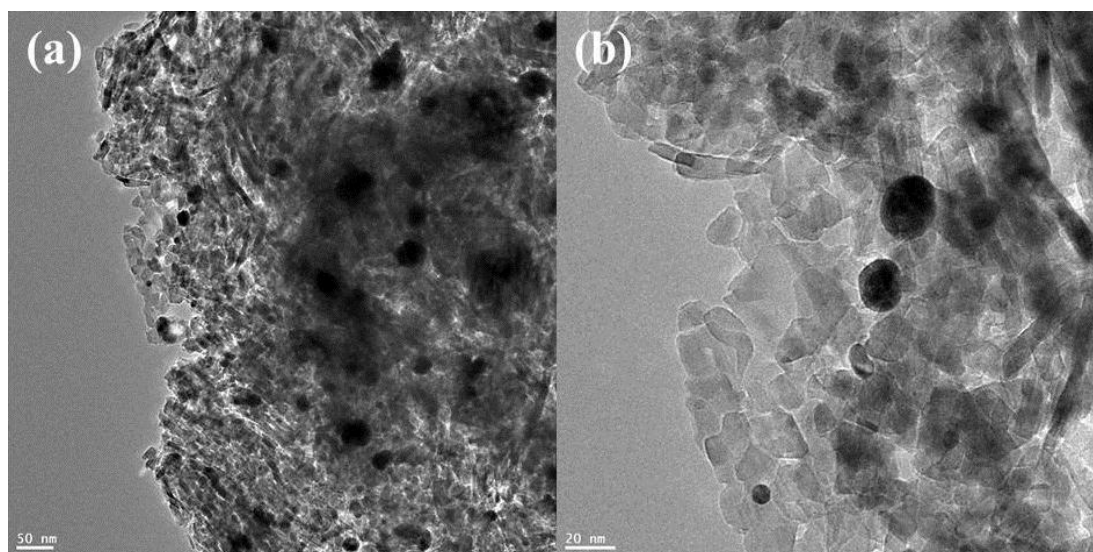


Figure S15 TEM images of the ground FAT-500 loaded with 1% Pt.

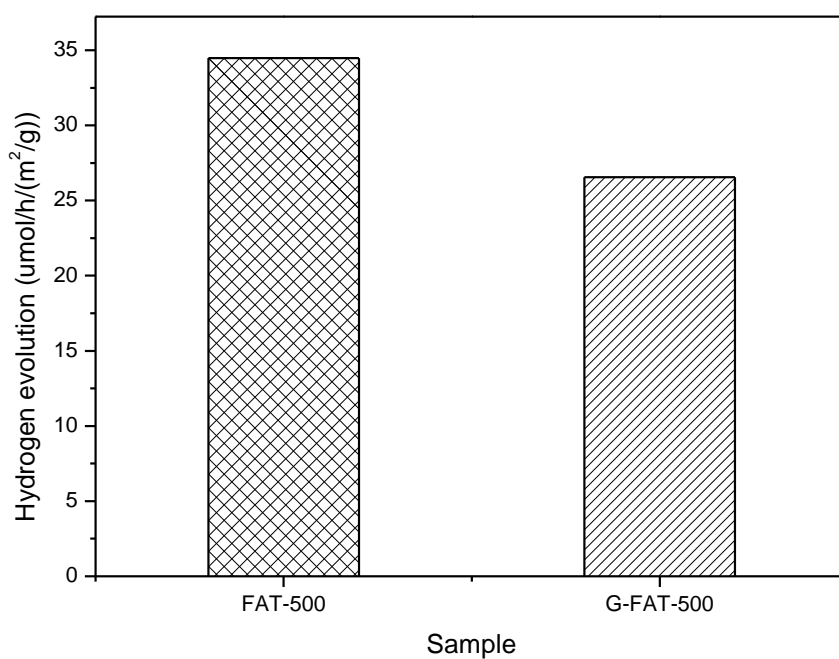


Figure S16 Photocatalytic hydrogen evolution performed on the ground FAT-500 compared with that of FAT-500 loaded with 1% Pt, respectively.

Table S1 Crystallite size of the TiO₂ nanoparticles obtained at various temperatures

Sample	FAT-160	FAT-400	FAT-500	FAT-600
Temperature (°C)	160	400	500	600
Crystallite size (nm)	8	13	18	22