

## Supporting Information

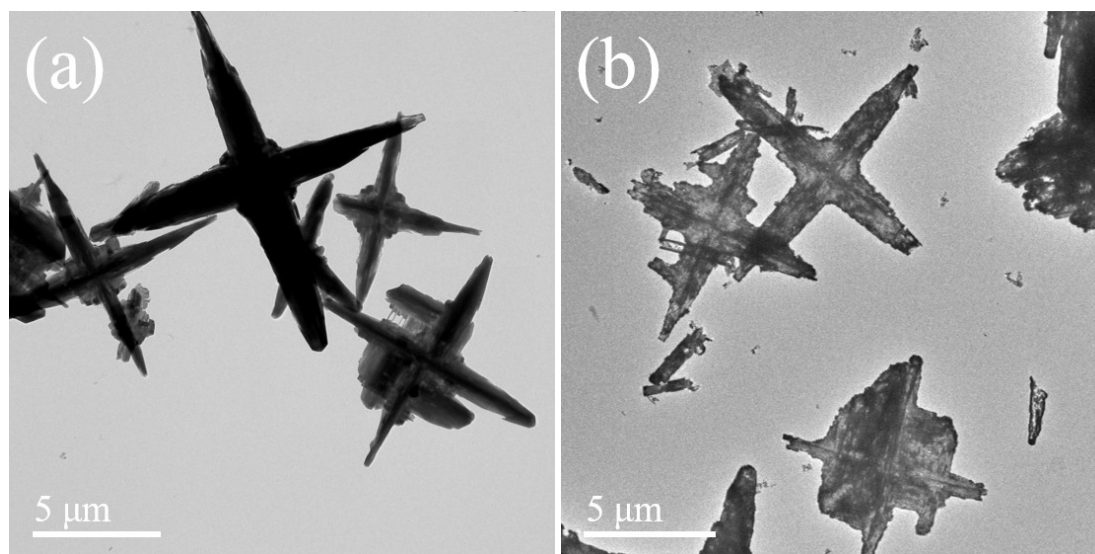
### Fast Growth of Precursors for 3D Ordered TiO<sub>2</sub> Mesocrystals: from (NH<sub>4</sub>)<sub>2</sub>TiOF<sub>4</sub> Plates to NH<sub>4</sub>TiOF<sub>3</sub> Disks

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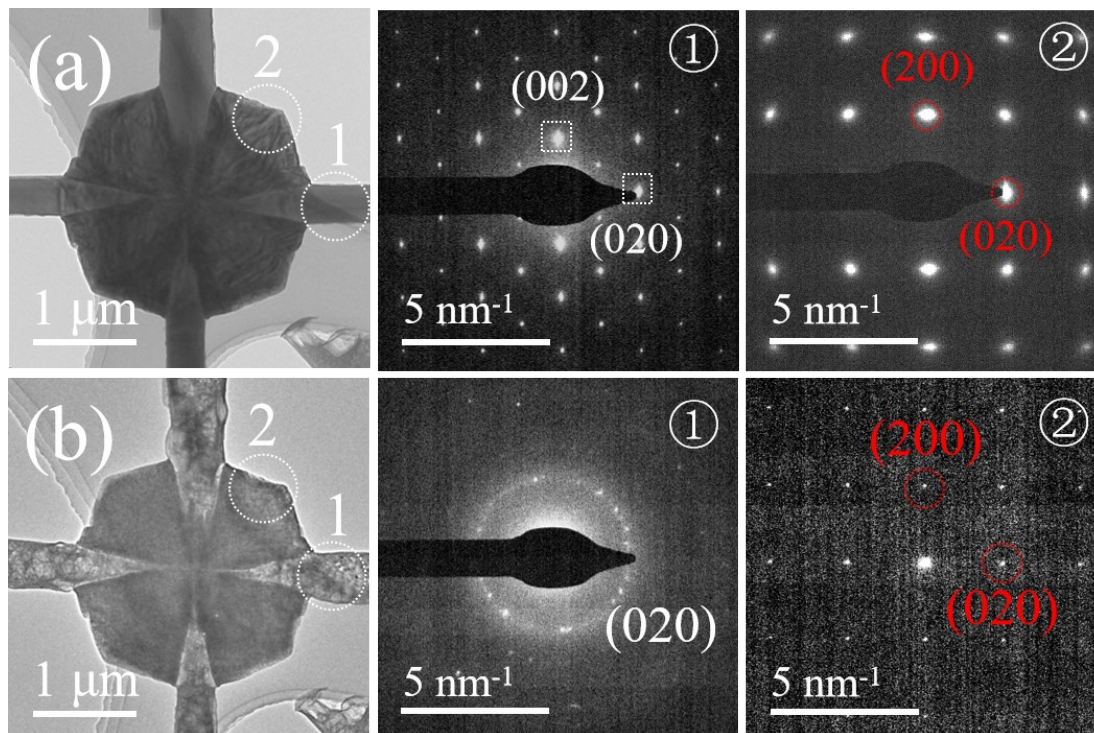
Fig. S1 shows low magnification TEM images for ammonium oxofluorotitanate samples grown for 8 min at 200 mA cm<sup>-2</sup> in EG with 1 wt% NH<sub>4</sub>F and 18 wt% H<sub>2</sub>O before (a) and after (b) thermal heating. It can be seen that the tetrapod structure with a disk at the center is a representative structure of the obtained samples.



**Fig. S1** Low magnification TEM images for typical ammonium oxofluorotitanate samples grown for 8 min at 200 mA cm<sup>-2</sup> in EG with 1 wt% NH<sub>4</sub>F and 18 wt% H<sub>2</sub>O before (a) and after (b) thermal heating.

Fig. S2 shows a typical ammonium oxofluorotitanate sample grown for 8 min at 200 mA cm<sup>-2</sup> in EG with 1 wt% NH<sub>4</sub>F and 18 wt% H<sub>2</sub>O before (a) and after (b) electron irradiation. As determined by selected area electron diffraction (SAED), rods of this tetrapod-like structure are (NH<sub>4</sub>)<sub>2</sub>TiOF<sub>4</sub>, while the disk is NH<sub>4</sub>TiOF<sub>3</sub>. It is shown that after the same dose of electron beam irradiation, the single crystal-like structure of (NH<sub>4</sub>)<sub>2</sub>TiOF<sub>4</sub> was degraded to polycrystalline structure, while for NH<sub>4</sub>TiOF<sub>3</sub>, the single crystal-like structure was kept. TEM image in Fig. S1b shows clear difference

in morphology for the  $(\text{NH}_4)_2\text{TiOF}_4$  and  $\text{NH}_4\text{TiOF}_3$  part of the structure after electron diffraction.



**Fig. S2** TEM images and corresponding SAED patterns for typical ammonium oxofluorotitanate samples grown for 8 min at  $200 \text{ mA cm}^{-2}$  in EG with 1 wt%  $\text{NH}_4\text{F}$  and 18 wt%  $\text{H}_2\text{O}$  before (a) and after (b) electron irradiation.