Bottom-up synthesis of titanophosphate nanosheets by the aqueous solution process

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Figure S1  XRD patterns of the powders prepared by heating the mixtures of TIP and H$_3$PO$_4$ with H$_3$PO$_4$/TIP molar ratios of (a) 1, (b) 10, and (c) 20 at 100 °C.
Figure S2  XRD patterns of the thin films fabricated by evaporating titanophosphate nanosheet sols on a glass substrate. The titanophosphate nanosheet sols were prepared by heating the mixtures of TIP, H₃PO₄, and NR₄OH with a molar ratio of TIP / H₃PO₄ / NR₄OH = 1 / 1 / 2.2 at 80 °C. The used NR₄OH was (a) TMAOH, (b) TEAOH, (c) TPAOH, and (d) TBAOH.

Figure S3  Raman spectra of the titanophosphate nanosheets prepared by evaporating titanophosphate nanosheet sols and then washed with 2-PrOH. The titanophosphate nanosheet sols were prepared by heating the mixtures of TIP, H₃PO₄, and NR₄OH with a molar ratio of TIP / H₃PO₄ / NR₄OH = (a, b) 1 / 1 / 2 and (c) 1 / 1 / 2.5 at 80 °C. The used NR₄OH was (a) 2.8 M TMAOH, (b) 1.4 M TEAOH, and (c) 0.5 M TPAOH. The marks * are assigned to NR₄⁺ ions. For comparison, the Raman spectrum of layered titanium phosphate Ti₂O₅(H₂PO₄)₂ 2H₂O is also shown.
Figure S4  XRD patterns of the powders prepared from the titanophosphate nanosheet sols synthesized from the sols (a) prepared at TIP / H$_3$PO$_4$ / TPAOH = 1 / 1 / 2.5 using 0.5 M TPAOH and prepared at TIP / H$_3$PO$_4$ / TEAOH = 1 / 1 / (b) 2.0 and (c) 2.2 using 1.4 M TEAOH. The sample (a), (b), and (c) correspond to O (large), Δ (medium), and × (small), respectively.
Figure S5  TEM images of the titanophosphate nanosheets synthesized (a) from the aqueous mixture with a molar ratio of TIP / H₃PO₄ / TPAOH = 1 / 1 / 2.2 in very weakly basic aqueous sols with a pH value of about 9, (b) from the aqueous mixture with a molar ratio of TIP / H₃PO₄ / TEAOH = 1 / 1 / 2, which was prepared by using 1.4 M TEAOH solution, and (c) from the aqueous mixture with a molar ratio of TIP / H₃PO₄ / TBAOH = 1 / 1 / 2, which was prepared by using 1.5 M TBAOH solution.
**Figure S6**  XRD pattern of the precipitates formed by adding titanophosphate nanosheet powder including an amorphous phase to copper acetate aqueous solution.