

Supporting information

Hydrothermal synthesis of layered titanium phosphate $\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$ and its potential application in cosmetics

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1. EDX analysis of the samples

Table S1. Data of the energy dispersive X-ray analysis.

	P, at. %	Ti, at. %	Error, %	P:Ti ratio
TiP0	0	100%	-	-
TiP0.5	4.59	95.41	2.14	0.05
TiP0.75	54.08	45.92	3.52	1.18
TiP1	56.63	43.37	4.34	1.31
TiP1.5	59.05	40.95	1.81	1.44
TiP2	60.70	39.30	2.13	1.54
TiP4	60.52	39.48	1.40	1.53

2. Photocatalytic measurements setup

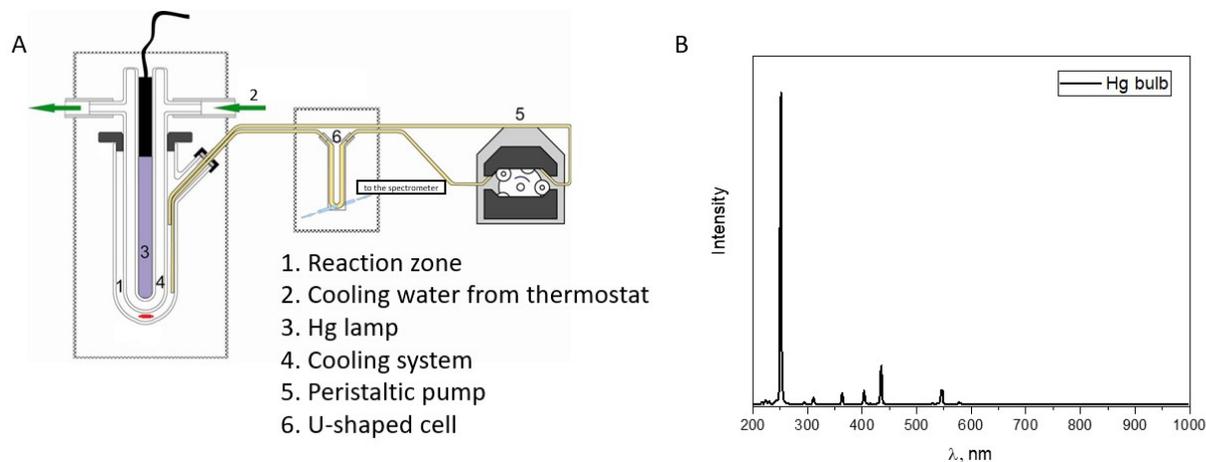


Figure S1. A) Scheme of the photocatalytic measurements setup. B) Spectrum of the Hg bulb.

3. Additional SEM images

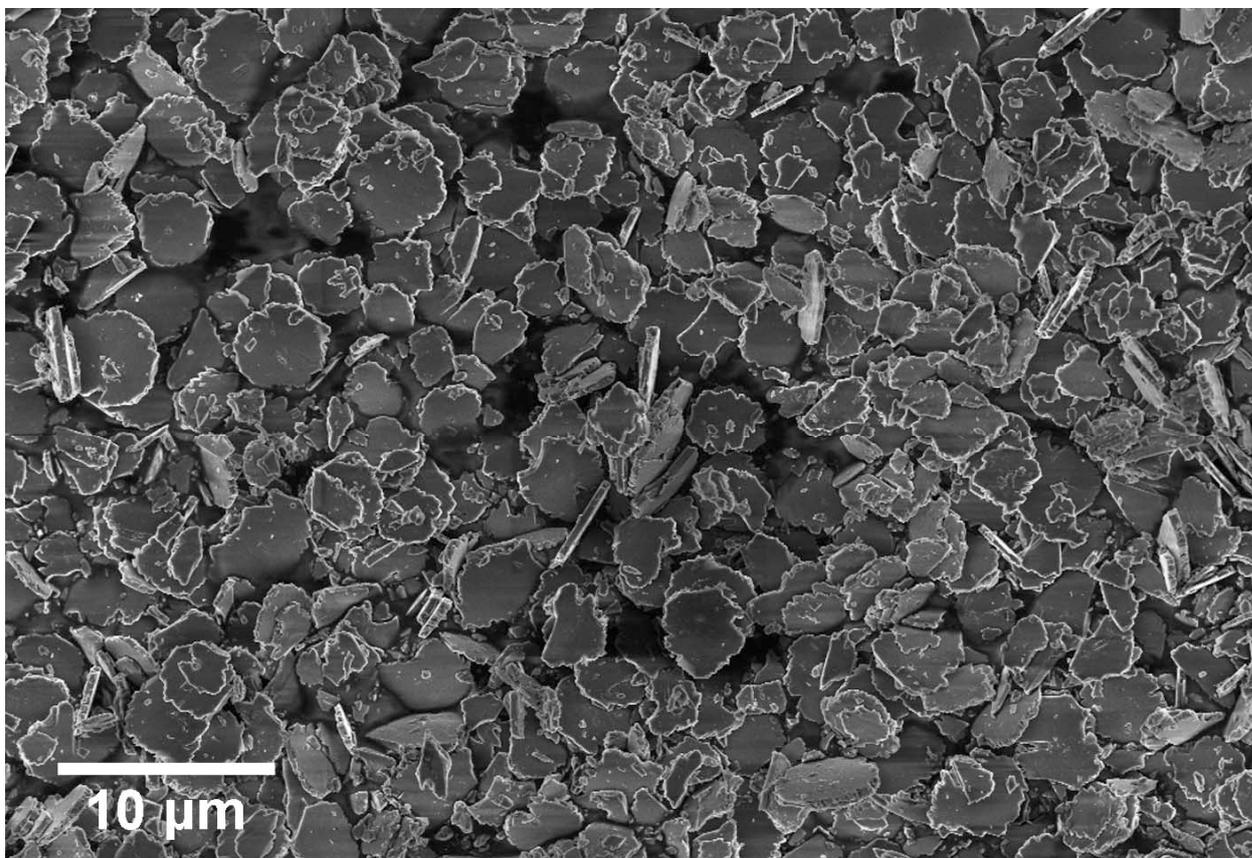


Figure S2. The microstructure of the TiP₄ sample prepared by hydrothermal treatment of titanium lactate complex at 180 °C in the presence of urea and phosphate ions and with Ti:P ratio of 1:4

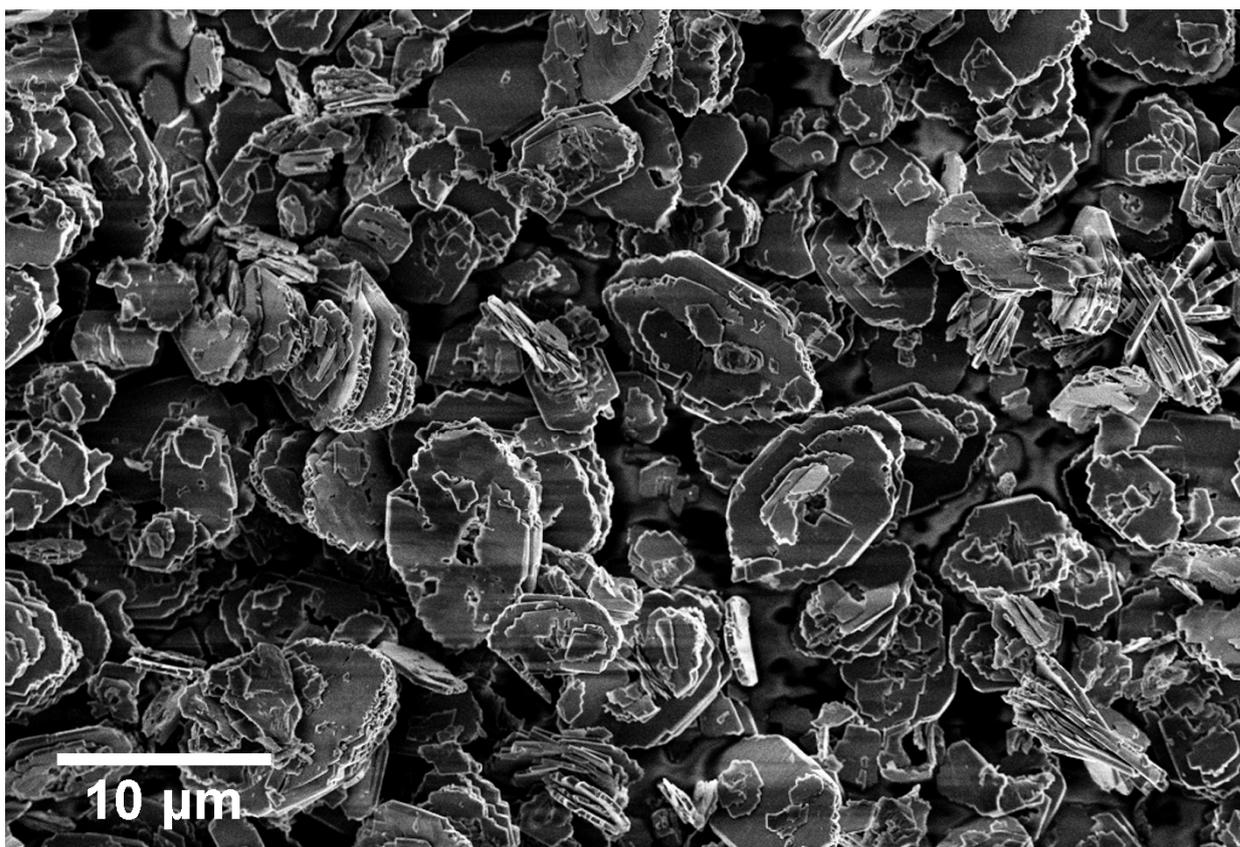


Figure S3. The microstructure of the TiP₂ sample prepared by hydrothermal treatment of titanium lactate complex at 180 °C in the presence of urea and phosphate ions and with Ti:P ratio of 1:2

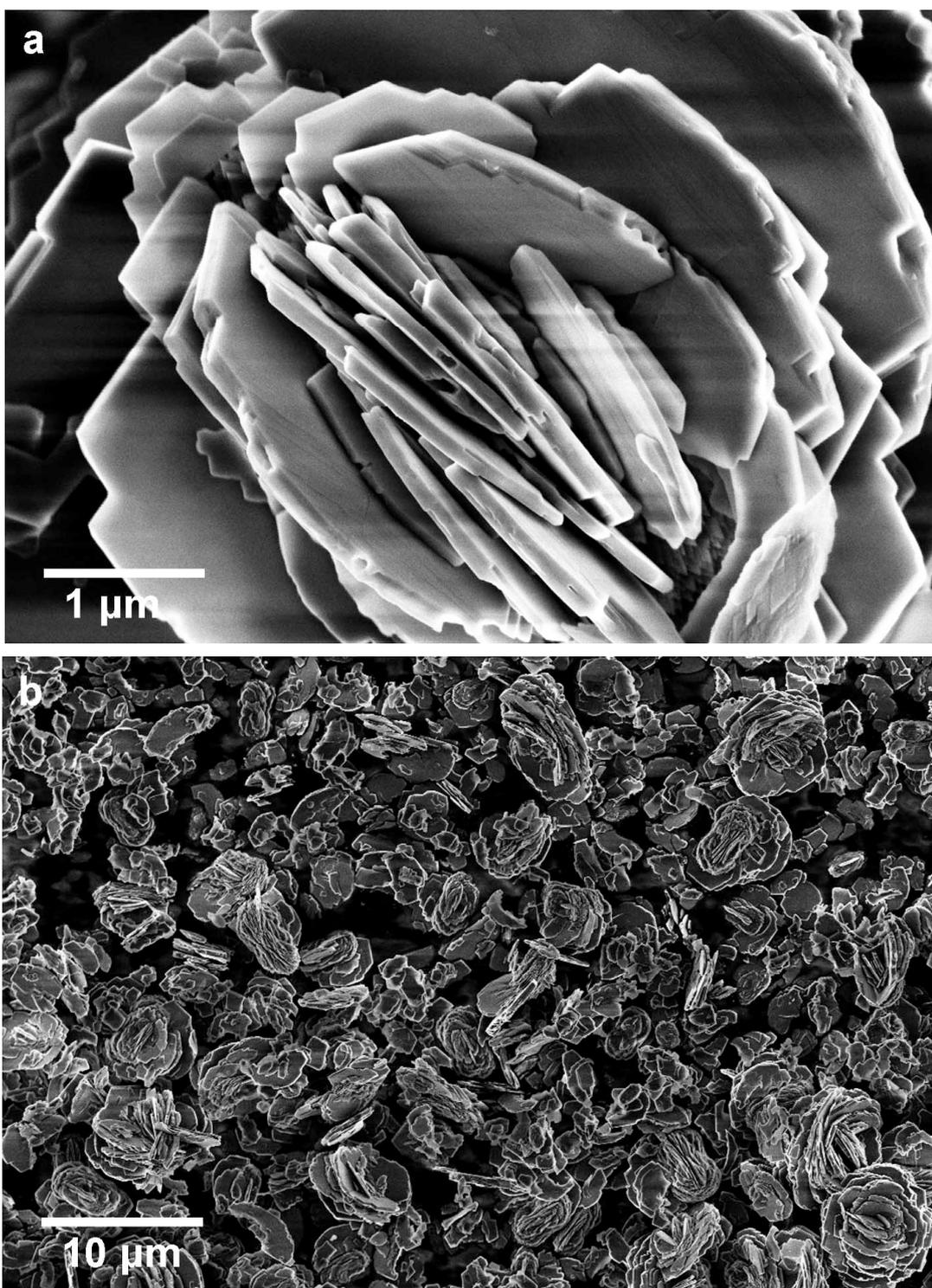


Figure S4. The microstructure of the TiP1.5, sample prepared by hydrothermal treatment of titanium lactate complex at 180 °C in the presence of urea and phosphate ions and with Ti:P ratio of 1:1.5. a,b – magnification 50 000 and 5 000 respectively.

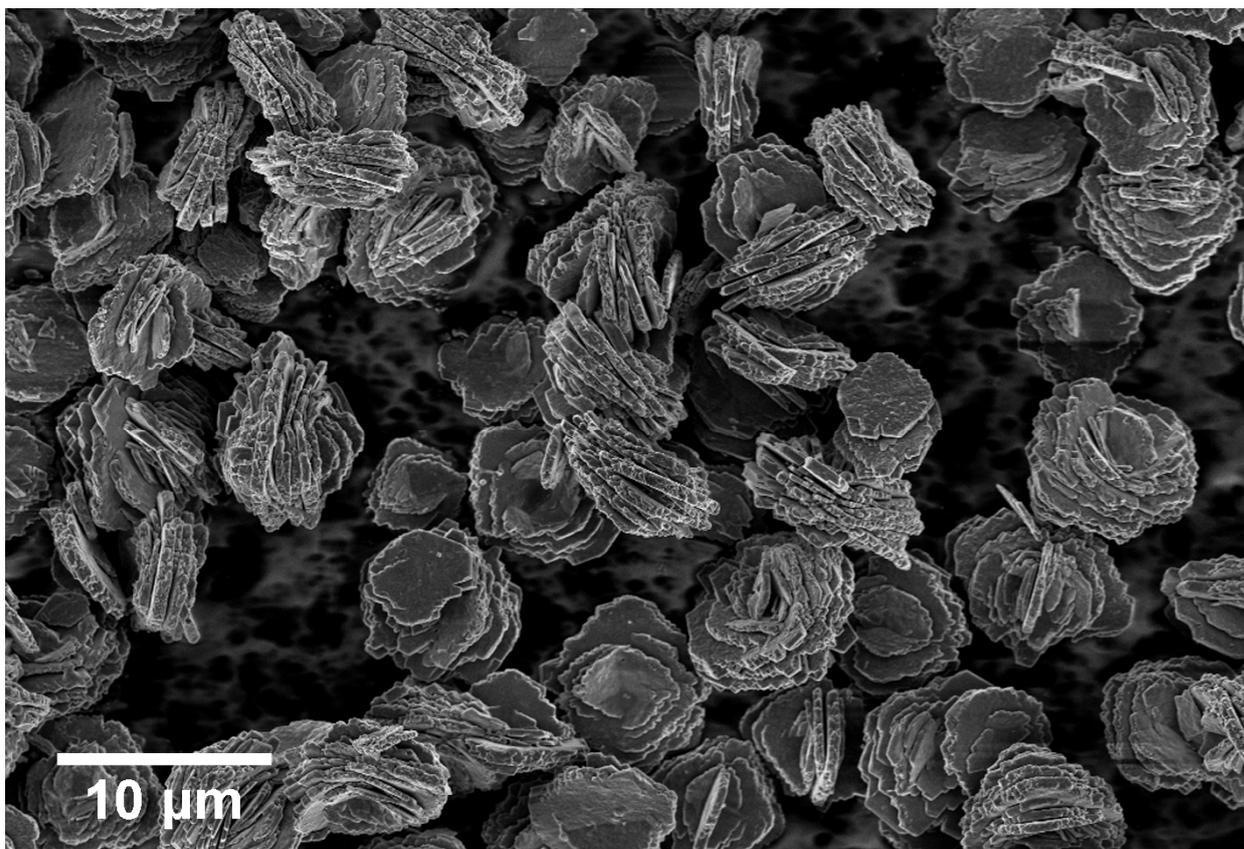


Figure S5. The microstructure of the TiP1, sample prepared by hydrothermal treatment of titanium lactate complex at 180 °C in the presence of urea and phosphate ions and with Ti:P ratio of 1:1

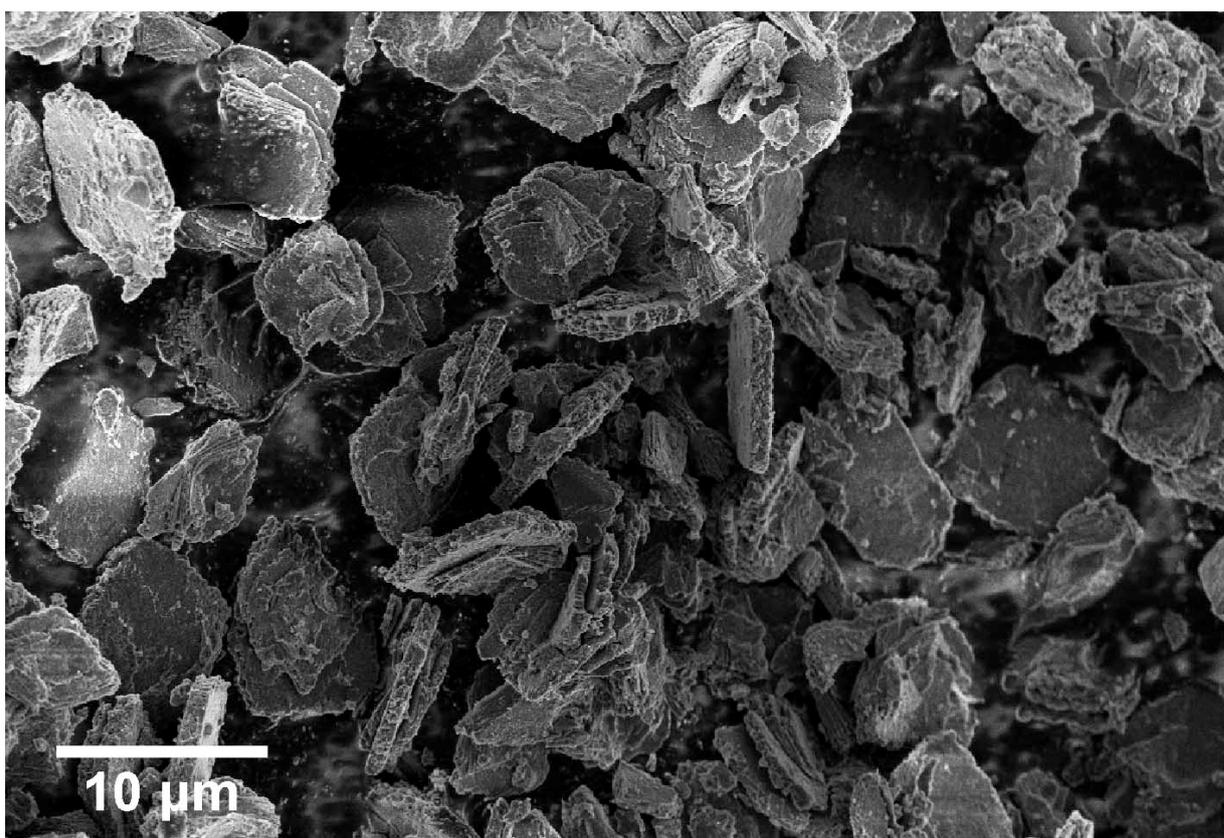


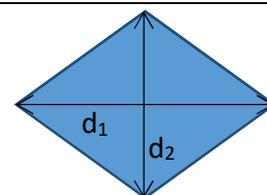
Figure S6. The microstructure of the TiP0.75, sample prepared by hydrothermal treatment of titanium lactate complex at 180 °C in the presence of urea and phosphate ions and with Ti:P ratio of 1:0.75

4. Particle size estimation:

Thickness of the $\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$ plates is provided in the Table 2. Assuming plates of $\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$ as rhombs with diagonals d_1 and d_2 , the particle size was estimated.

Table S2. Particle size parameters for the samples, which contain $\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$.

	Thickness, μm	St. dev., μm	d_1 , μm	St. dev., μm	d_2 , μm	St. dev., μm
TiP0.75	0.5	0.1	9.3	0.6	7.5	0.4
TiP1	0.4	0.1	8.3	0.6	7.3	0.5
TiP1.5	0.2	0.1	7.3	0.9	6.4	0.6
TiP2	0.2	0.1	7.3	0.9	4.5	0.8
TiP4	0.2	0.1	4.5	0.6	3.6	0.4



5. Determination of $\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$ optical gap:

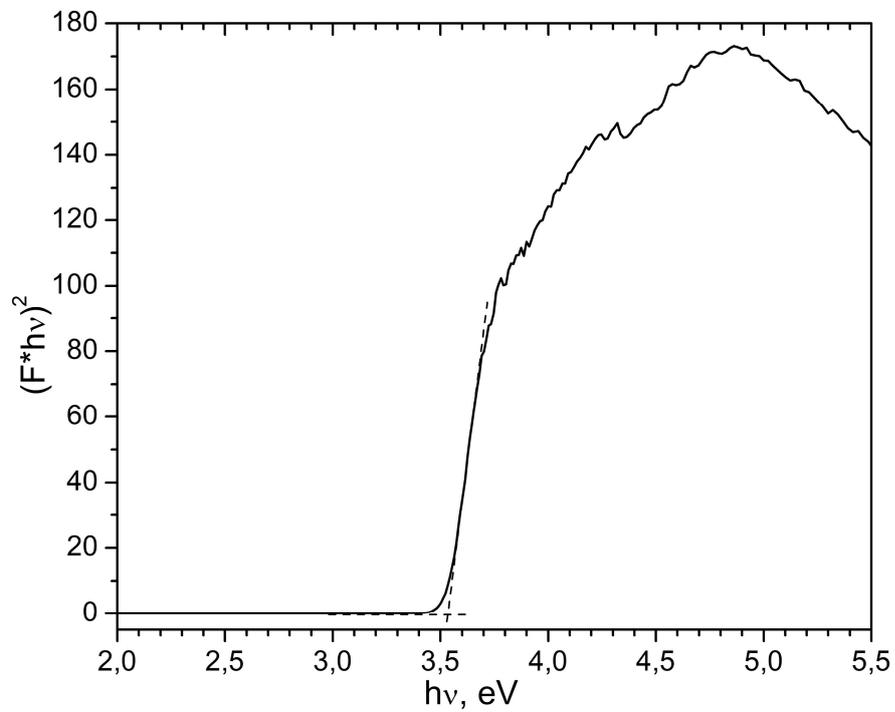


Figure S7. Plot of $(F \cdot h\nu)^2$ vs. $h\nu$, TiP4 sample ($\text{Ti}_2\text{O}_2\text{H}(\text{PO}_4)[(\text{NH}_4)_2\text{PO}_4]_2$): $E_g=3.53$ eV.

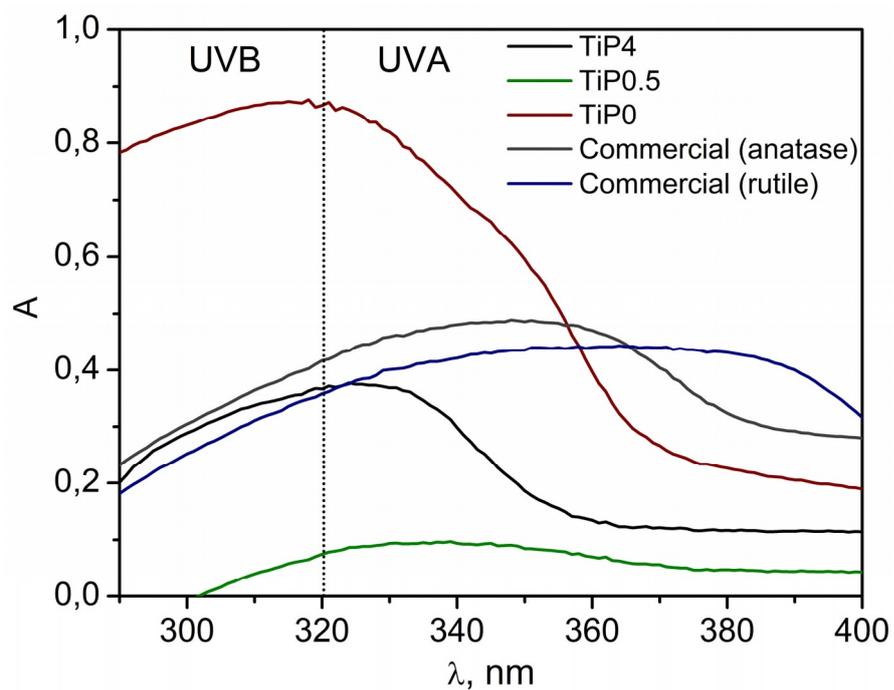


Figure S8. Absorption spectra in UV regions of 10% suspensions of the two commercial samples of TiO₂ and the experimental samples prepared in this study: TiP0 (brookite), TiP0.5 (anatase), and TiP4 (Ti₂O₂H(PO₄)[(NH₄)₂PO₄]₂).