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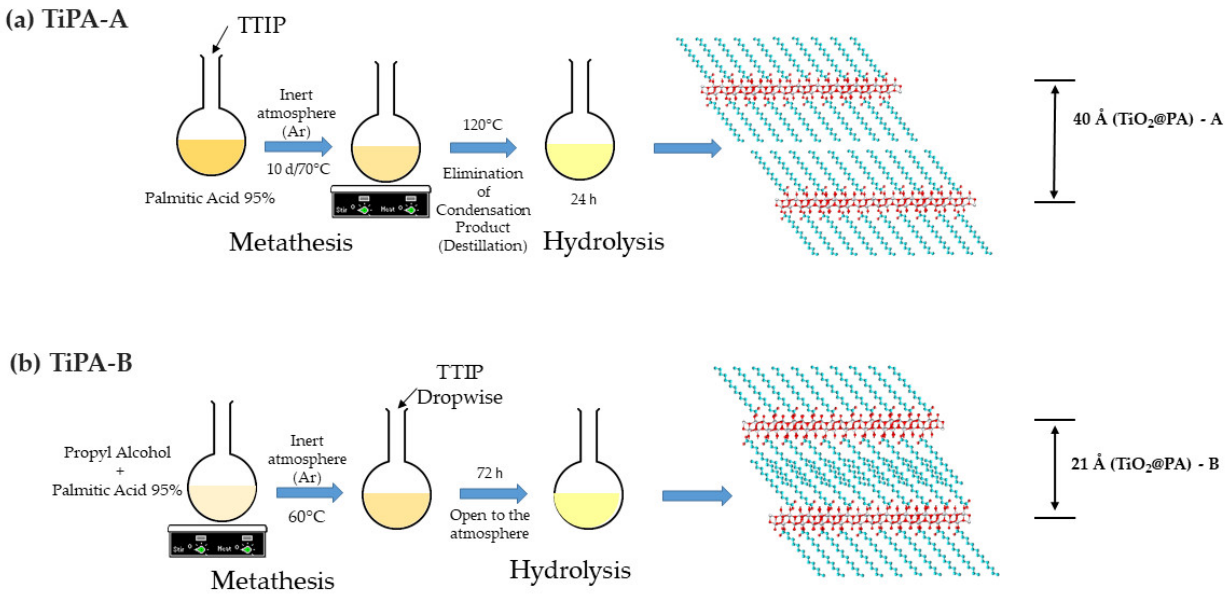
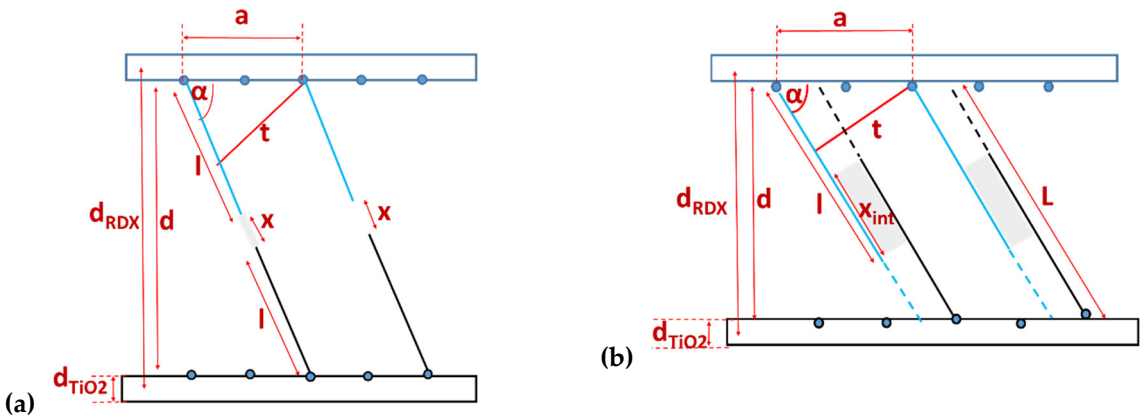
Supplementary Information

Two-Dimensional Titanium Dioxide–Surfactant Photoactive Supramolecular Networks: Synthesis, Properties, and Applications for the Conversion of Light Energy



Scheme S1. Diagram of synthesis methods of TiO_2@Surfactants nanocomposites. Sequential process (**a**) and Concurrent process (**b**).



Scheme S2. Geometric model to describe the structure of commensurate TiO_2@fatty acids. Sequential process (**a**) and Concurrent process (**b**).

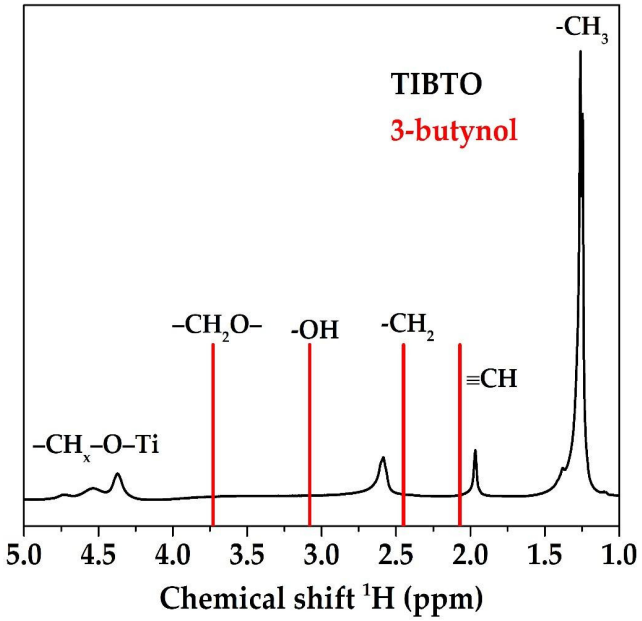


Figure S1. ^{1}H-NMR spectrum of the intermediate molecular dimer $[Ti(TIP)_3(BTO)(OH)_2]_2O$ in $CDCl_3$ solution at room temperature. Chemical shifts (ppm, relative to tetramethylsilane TMS). Red lines indicate the chemical changes of 3-butyn-1-ol.

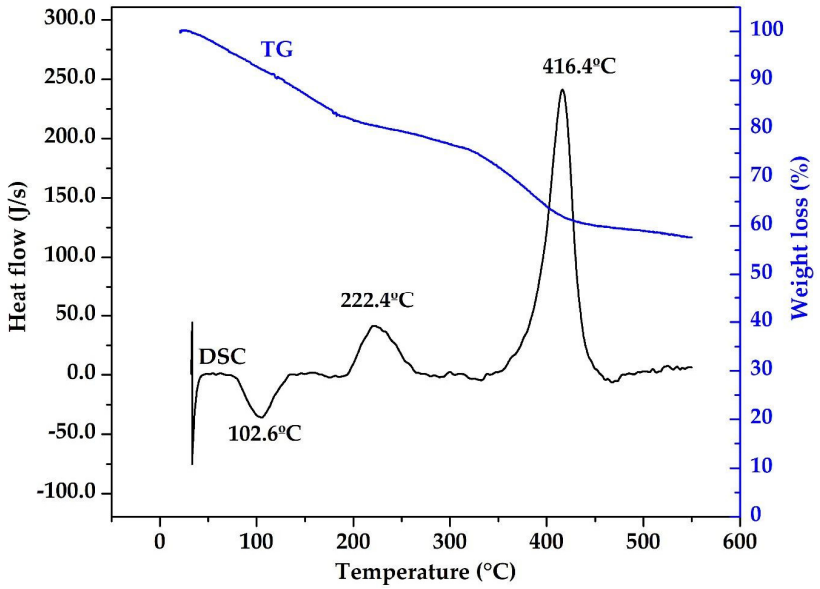


Figure S2. Thermal analysis of TiBTO. Left axis, DSC analysis; right axis, TG analysis.

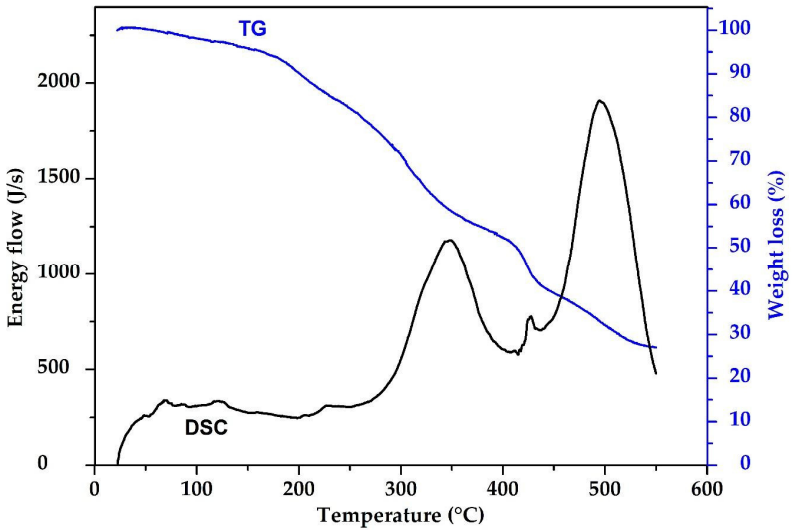


Figure S3. Thermal analysis of TiPA–A. Left axis, DSC analysis; right axis, TG analysis.

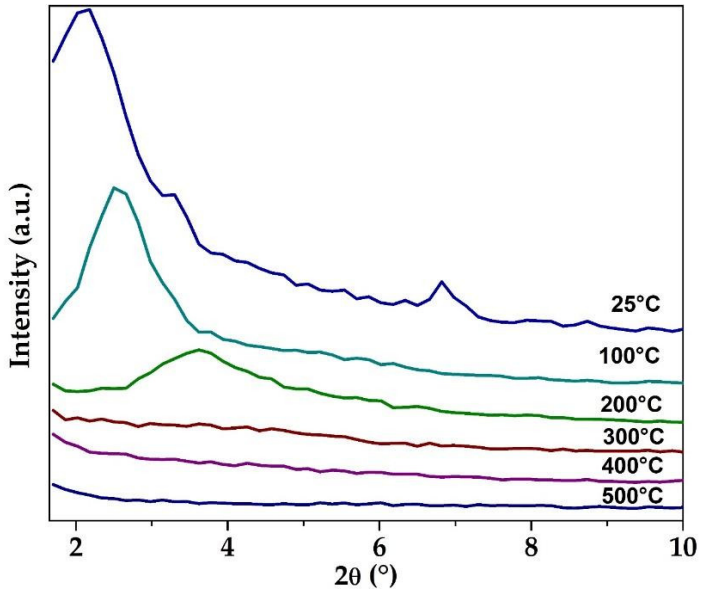


Figure S4. XRD patterns of TiPA–A samples heated in air at different temperatures.

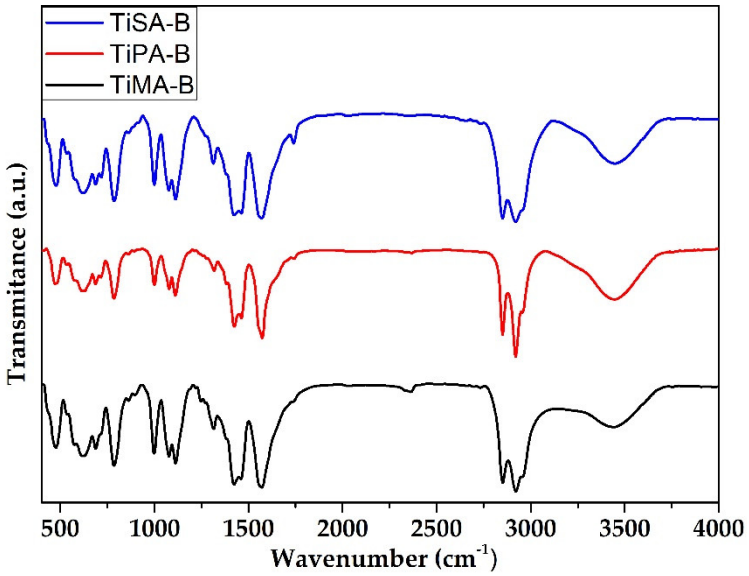


Figure S5. FTIR spectra of TiO_2@fatty-acid nanocomposites prepared through the concurrent process. TiMA–B (a); TiPA–B (b); and TiSA (c).

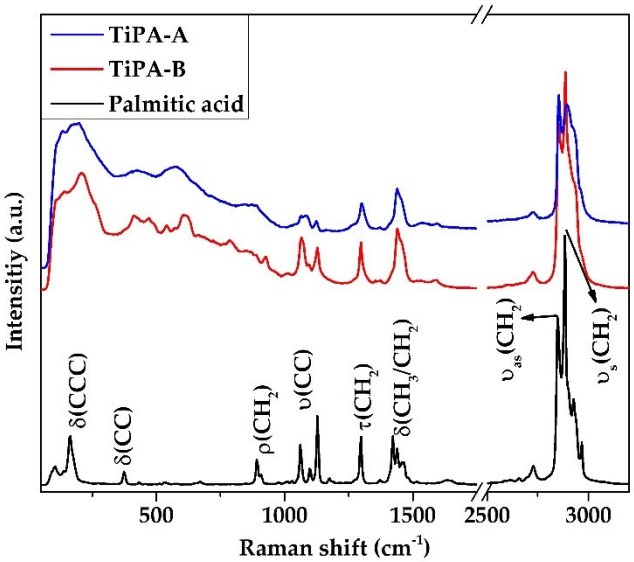


Figure S6. Raman scattering in the range of 1200 to 3200 cm^{-1} for TiMA–A, TiMA–B and pristine myristic acid.

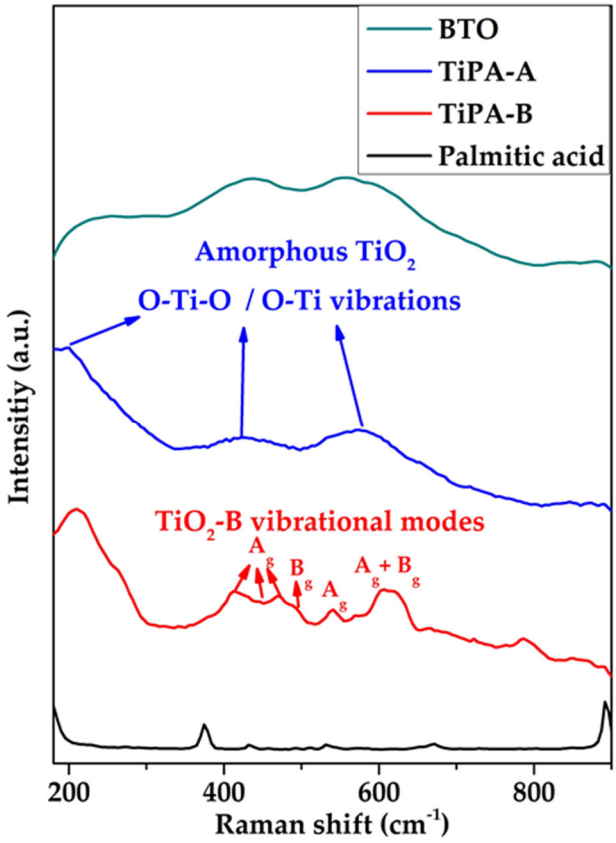


Figure S7. Raman scattering in the range of 0 to 950 cm^{-1} for TiPA–A, TiPA–B, and TiBTO and palmitic acid samples.

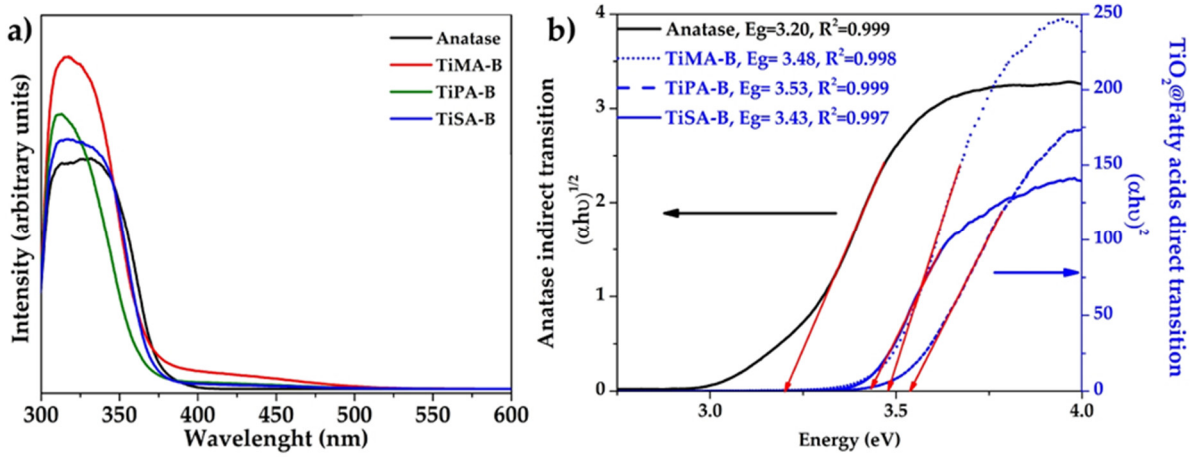


Figure S8. Absorbance spectra of TiFA-B semiconductor nanocomposites and of anatase (**a**); band gaps of TiFA–B semiconductor nanocomposites for a direct transition (right axis) compared to that of TiO_2–anatase for an indirect transition (left axis), calculated by the Tauc relationship. M (TiMA): 3.48 eV, R^2= 0.998; S (TiPA): 3.53 eV, R^2= 0.999; P(TiSA): 3.43 eV, R^2=0.997 (**b**).

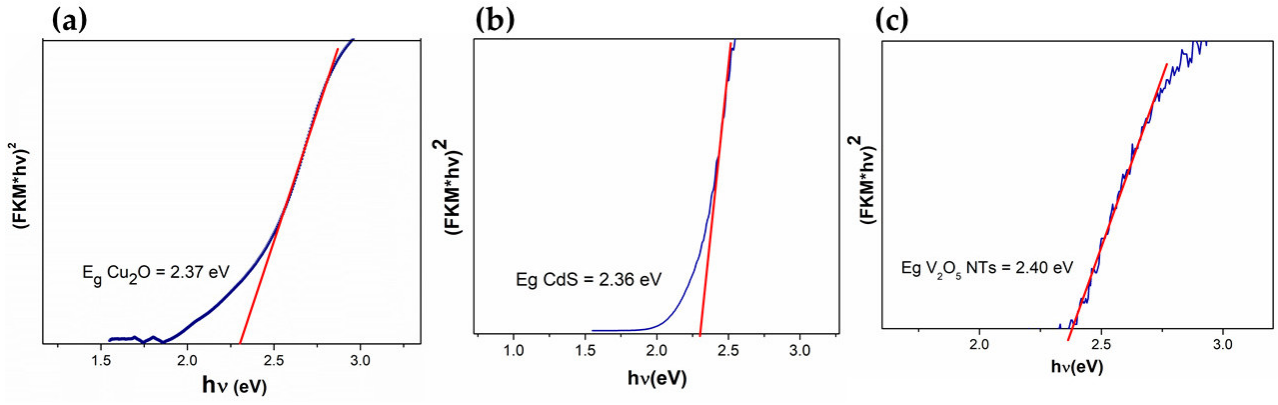


Figure S9. Tauc plots of Cu_2O (**a**), CdS (**b**), and V_2O_5 (**c**).

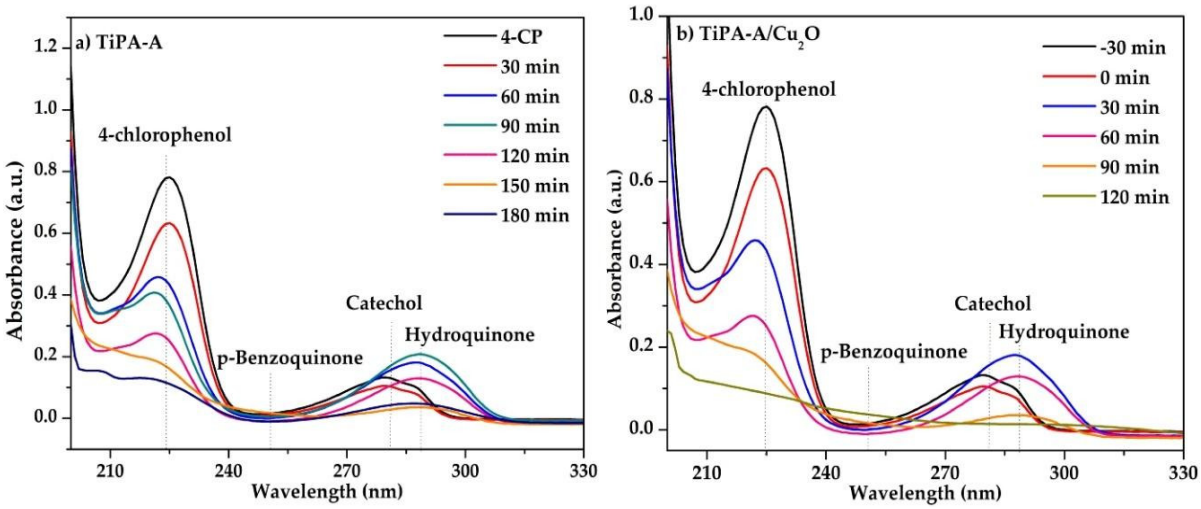


Figure S10. Simulated-solar light-driven degradation of 4–chlorophenol (4–CP) assisted by TiPA–A (**a**) and by composite TiPA–A/Cu_2O (**b**).

Table S1. Chemical composition of the products obtained by the sequential process from the analysis of microelements and complemented with thermogravimetric analysis.

Sample	Analysis Exp.(calculated) %			Empirical Formula
	C	H	Ti	
TiBTO	30.4 (30.50)	4.00 (3.490)	30.3 (30.44)	$TiO_2(C_4H_5)\bullet 0.25(TiO_2\ H_2O)$
TiPA-A	49.8 (50.37)	10.2 (8.940)	17.9 (17.59)	$0.7[TiO_2(C_{16}H_{35}O)\bullet[HTiO_2(C_{16}H_{36}O_2)_{2.3}\bullet H_2O]$

Table S2. Chemical composition of the products obtained by the concurrent process from the analysis of microelements and complemented with thermogravimetric analysis.

Sample	Analysis Exp.(calculated) %			Empirical Formula
	C	H	Ti	
TiMA-B	60.81 (61.17)	10.37 (9.66)	12.67 (12.62)	$Ti(C_{14}H_{27}O)\bullet 0.42(C_{14}H_{28}O_2)\bullet 0.1[HTiO_2(C_{14}H_{27}O)(H_2O)]$
TiPA-B	60.87 (60.91)	10,62 (11.56)	10.84 (10.85)	$Ti(C_{16}H_{35}O)\bullet 0.4(C_{16}H_{36}O_2)\bullet 0.4(H_2O)$
TiSA-B	61.10 (61.00)	10.37 (11.19)	12.67 (13.09)	$Ti(C_{18}H_{39}O)\bullet 0.03(C_{18}H_{40}O_2)\bullet 0.3(H_2O)$