Electronic Supplementary Information For

Bio-inspired synthesis of titania with polyamine induced the morphology and phase transformation at room-temperature: insight into the role of protonated amino group

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Table S1. Syntheses conditions, precipitate weight, yield, morphology, main phase, crystallite size, and BET surface areas of samples

Sample 1: PAH-mediated precipitates from $Ti(SO_4)_2$ solution

Polymer	Ti precursor	Reaction time/day	pH value of solution	Precipitate weight/g	Yield[d]	Morphology	Main phase	Crystallite size/nm	S_{BET}[i]/m^2g^{-1}
PAH	$Ti(SO_4)_2$	5	1.31	0.0182	5.3%	Solid spheres	—[e]		57.6
PAH	$Ti(SO_4)_2$	15	1.24	0.0447	18.1%	Solid spheres	A[a]	A_{101}[f]=2.9	98.1
PAH	$Ti(SO_4)_2$	30	1.19	0.0840	40.5%	Hollow spheres	A	A_{101}=3.1	116.6
PAH	Ti(SO4)2	60	1.11	0.0868	42.6%	Hollow spheres	A and R[b]	A_{101}=2.9 R_{110}[g]=4.3	129.8
PAH	$Ti(SO_4)_2$	120	1.10	0.0871	43.5%	Hollow spheres	A and R	A_{101}=2.8 R_{110}=4.4	138.4

Sample 2: PDDA-mediated precipitates from $Ti(SO_4)_2$ solution

Polymer	Ti precursor	Reaction time/day	pH value of solution	Precipitate weight/g	Yield	Morphology	Main phase	Crystallite size/nm	S_{BET}/m^2g^{-1}
PDDA	$Ti(SO_4)_2$	5	1.27	0.0242	8.7%	Aggregated nanoparticles	—		9.1
PDDA	$Ti(SO_4)_2$	15	1.20	0.0621	23.5%	Aggregated nanoparticles	—		12.4
PDDA	$Ti(SO_4)_2$	30	1.19	0.0628	28.9%	Aggregated nanoparticles	A	A_{101}=3.0	13.0
PDDA	Ti(SO4)2	60	1.08	0.0669	32.3%	Aggregated nanoparticles	A	A_{101}=3.2	18.9

Sample 3: PAH-mediated precipitates from Ti-BALDH solution

Polymer	Ti precursor	Reaction time/day	pH value of solution	Precipitate weight/g	Yield	Morphology	Main phase	Crystallite size/nm	S_{BET}/m^2g^{-1}
PAH	Ti-BALDH	5	6.38	0.0341	15.8%	Aggregated nanoparticles	A	A_{101}=2.8	7.1
PAH	Ti-BALDH	15	5.92	0.0342	14.8%	Aggregated nanoparticles	A	A_{101}=2.8	9.1
PAH	Ti-BALDH	30	5.88	0.0328	15.3%	Aggregated nanoparticles	A	A_{101}=2.9	8.8
PAH	Ti-BALDH	60	5.88	0.0344	15.1%	Aggregated nanoparticles	A	A_{101}=2.8	9.6

Sample 4: PDDA-mediated precipitates from Ti-BALDH solution

Polymer	Ti precursor	Reaction time/day	pH value of solution	Precipitate weight/g	Yield	Morphology	Main phase	Crystallite size/nm	S_{BET}/m^2g^{-1}
PDDA	Ti-BALDH	5	6.44	0.0488	24.4%	Hollow spheres	A and B[c]	A_{101}=3.0 B_{110}[h]=3.3	23.9
PDDA	Ti-BALDH	15	6.04	0.0576	27.4%	Hollow spheres	A and B	A_{101}=2.9 B_{110}=3.2	27.1
PDDA	Ti-BALDH	30	6.03	0.0580	28.6%	Hollow spheres	A and B	A_{101}=2.9 B_{110}=3.2	24.4
PDDA	Ti-BALDH	60	6.01	0.0581	27.1%	Hollow spheres	A and B	A_{101}=2.8 B_{110}=3.3	26.0

[a] A is anatase phase; [b] R is rutile phase; [c] B is TiO_2-B; [d] Yield is weight percentage of the obtained TiO_2 (after removal of organic and water components) to theoretical TiO_2 production; [e] — is amorphous; [f] A_{101} is crystallite size of anatase in [101] direction; [g] R_{110} is crystallite size of rutile in [110] direction; [h] B_{110} is crystallite size of TiO_2-B in [110] direction; (the crystallite size of titania were calculated by Scherrer equation using XRD pattern) [i] S_{BET} is Brunauer-Emmett-Teller (BET) surface areas of TiO_2.

Table S2. XPS results of atomic content of four samples: sample 1, 2, 3, and 4

Signal	Atomic content			
	Sample 1	Sample 2	Sample 3	Sample 4
O 1s	52.61%	40.41%	39.57%	40.61%
N 1s	2.76%	2.45%	3.32%	2.73%
C 1s	24.64%	41.79%	44.68%	43.05%
S 2p	3.86%	4.38%	–	–
Ti 2p	16.13%	10.79%	12.42%	13.96%

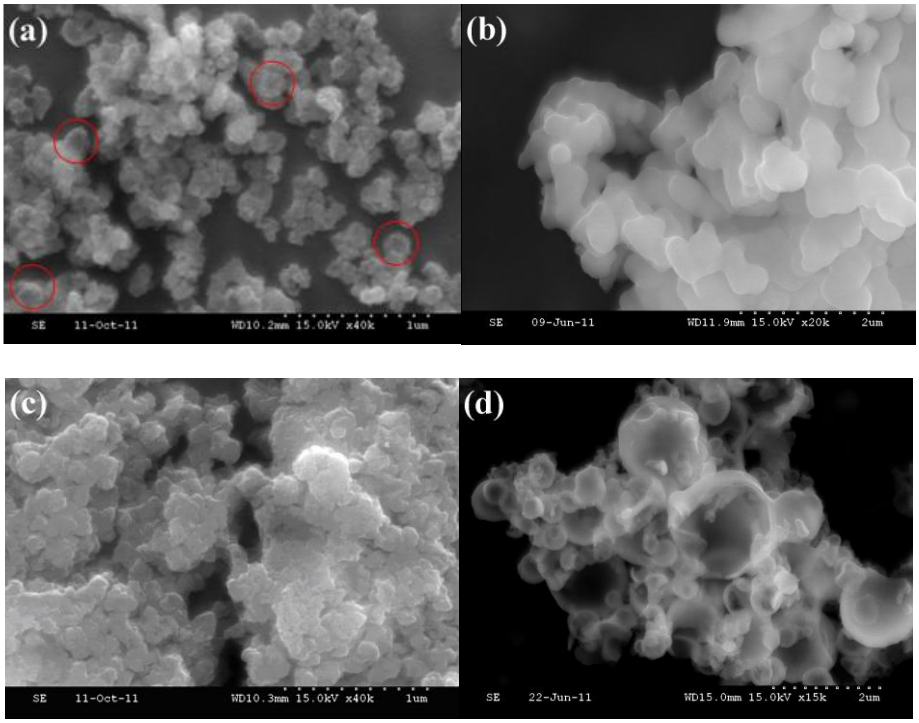

Figure S1. SEM images of four samples: a) sample 1, b) sample 2, c) sample 3, and d) sample 4. (Some fractions of hollow structure in sample 1 are showed by red circles in Fig. S1a)

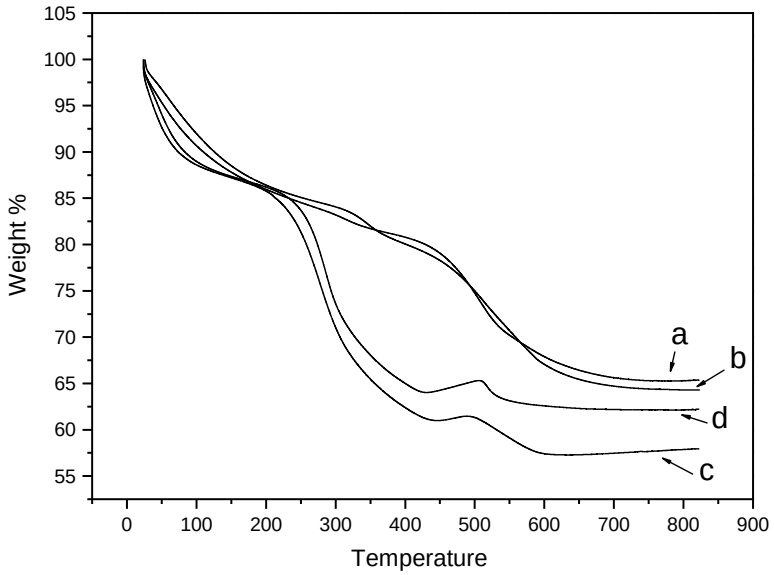

Figure S2. TGA scan of four samples: a) sample 1, b) sample 2, c) sample 3, and d) sample 4.

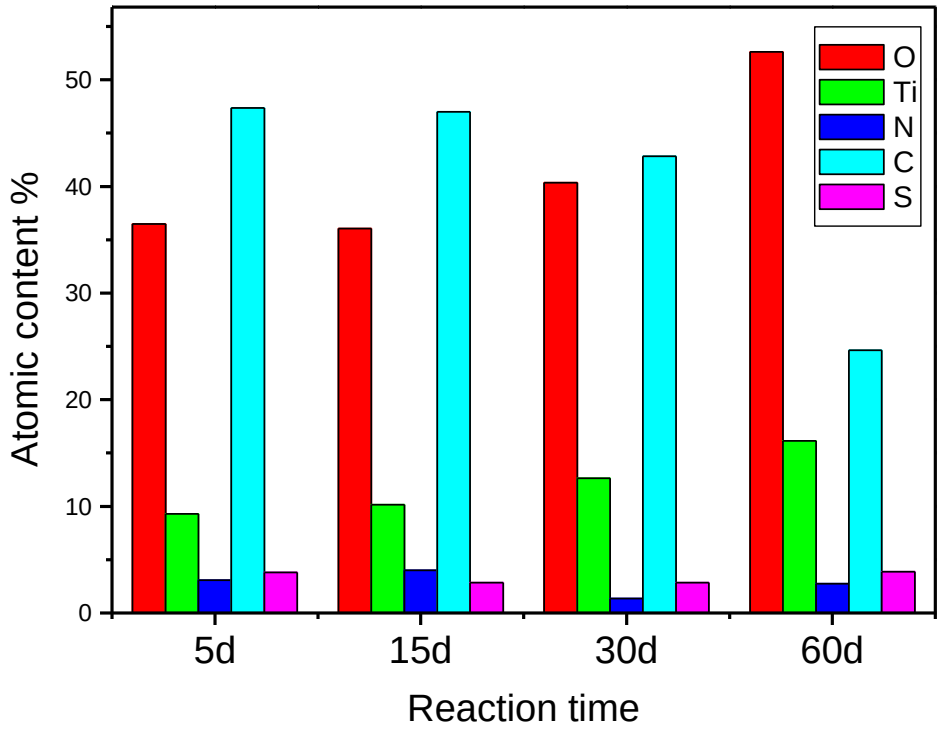

Figure S3. XPS measurements of the atomic content of the precipitates mediated by PAH from $Ti(SO_4)_2$ solution after different reaction time: 5d, 15d, 30d