

Photocatalytic bi-phasic titanium dioxide nanoparticles doped with nitrogen and neodymium

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1. List of samples

Rutile ↓ / Anatase →	Anatase	N-doped anatase	Nd-doped anatase	N and Nd doped anatase
Rutile	R/A	R/N-A	R/Nd-A	-
N-doped rutile	N-R/A	N-R/N-A	-	-
Nd-doped rutile	Nd-R/A	-	Nd-R/Nd-A	-
N and Nd doped rutile	-	-	-	N-Nd-R/N-Nd-A

Table S1. List of all the samples synthesised and their respective notations.

2. Particle size analysis by TEM

Sample	Average particle size (nm)
Titanium(IV) oxide, anatase powder, ~325 mesh, $\geq 99\%$ trace metals basis	94.1 ± 39.4
R/A	21.5 ± 8.4
Nd-R/Nd-A	19.4 ± 8.7
N-R/N-A	25.4 ± 13.9
N-Nd-R/N-Nd-A	20.6 ± 14.5
Nd-R/N-Nd-A	19.3 ± 9.7

Table S2. Exemplar average particle sizes by TEM. Standard deviations values are large, indicating a high degree of polydispersity in the product, primarily due to high shape anisotropy amongst synthesized particles.

3. Compositional analysis by XPS

	TiO ₂	R/A	N-R/N-A	Nd-R/Nd-A	Nd-R/N-Nd-A	N-Nd-R/N-Nd-A
Data Line	0	1	2	3	4	5
Na	0.46	11.95	9.56	5.99	13.69	7.7
O	33.98	16.66	20.12	44.05	25.92	41.01
Ti	12.49	7.09	9.44	15.38	11.11	16.24
N	0.04	0.28	0.34	0.5	0.31	0.2
K	0.89					
C	49.32	49.02	47.65	31.03	35.22	30.27
P	1.18					
Si	1.63					
Cl		15.02	12.88	2.26	13.06	3.35
Nd				0.78	0.67	1.24
Nd/Nd+Ti (%)				5.07	6.03	7.64
Nd/N+Nd+Ti (%)				4.68	5.54	7.01
N/N+Ti (%)	0.32	3.8	3.48	3.15	2.71	1.22
N/N+Nd+Ti (%)	0.32	3.8	3.48	3	2.56	1.13

Table S3. Compositional and oxide % of composites analysed by quantitative X-Ray photoelectron spectroscopy.

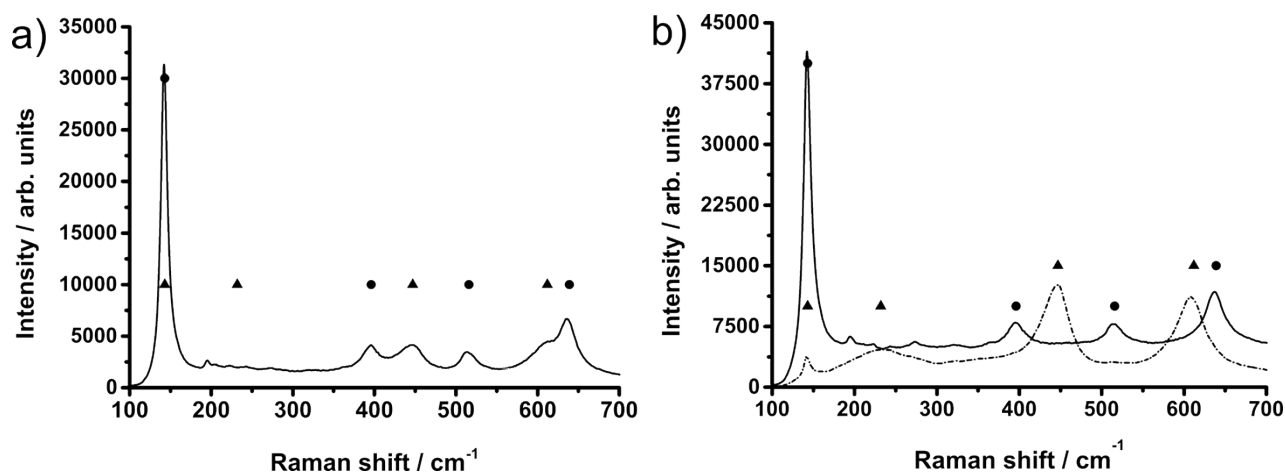
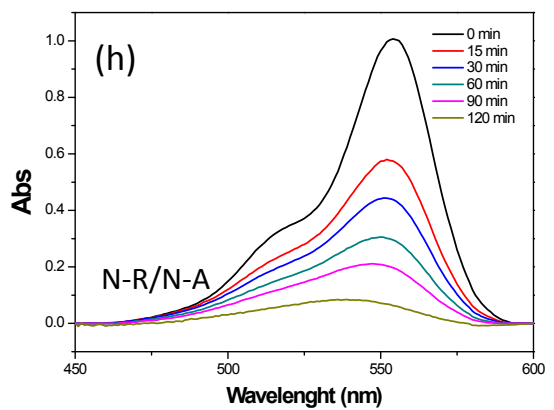
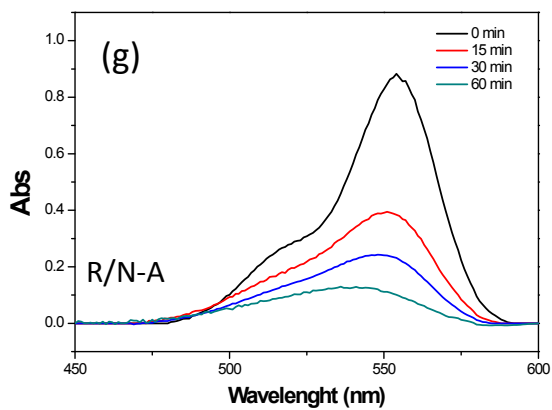
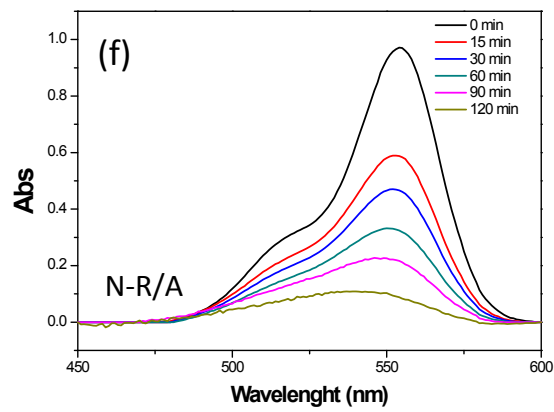
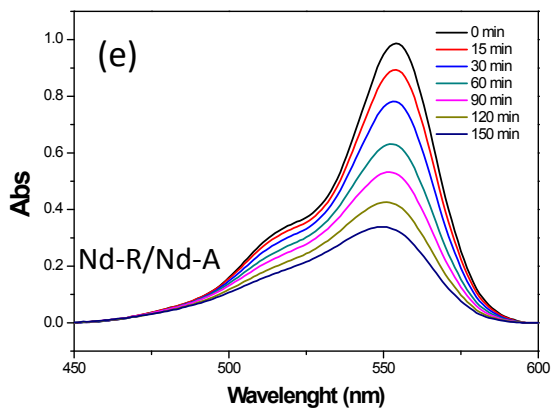
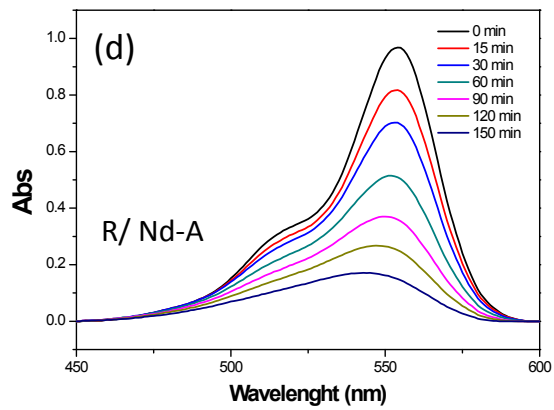
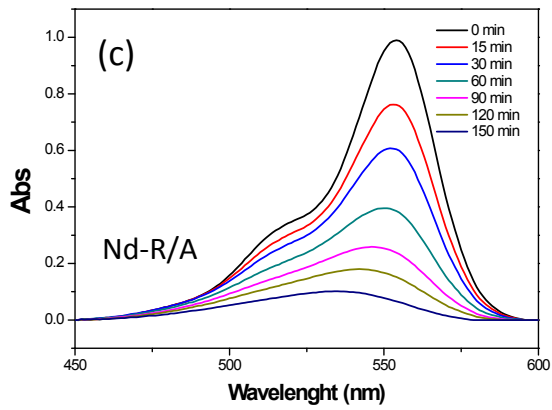
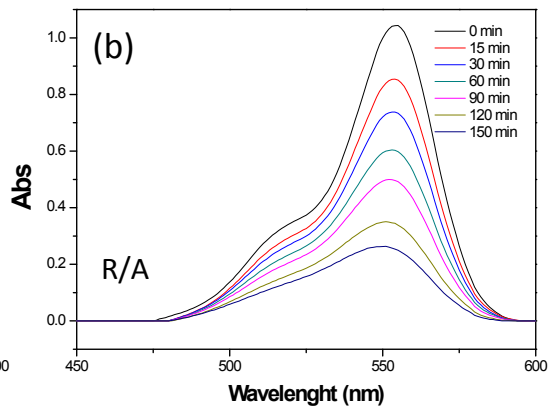
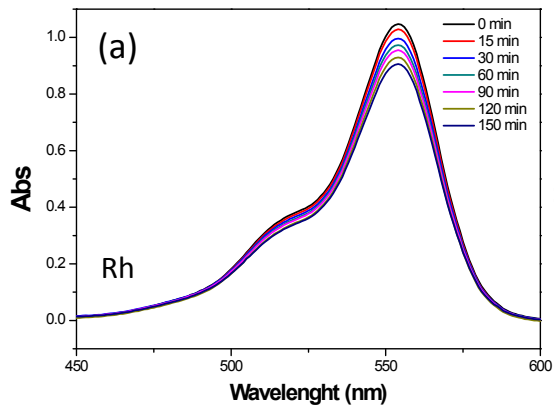


Figure S1. a) Raman spectra of the powdered R/A, indicating a mix of both anatase (circles) and rutile (triangles) titania phases. b) Raman spectra comparing the materials of the top and bottom of the disc recovered from a fragment of sample R/A.



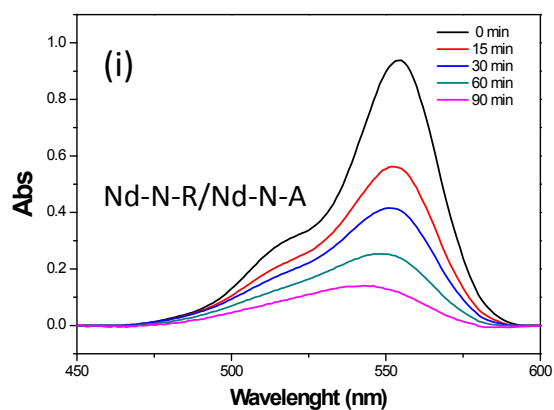


Fig. S2 Results for Rhodamine degradation; decrease in absorbance of neodymium doped samples as compared to pure titania R/A sample under UV light 365 nm. Reaction conditions: 25 °C, 5 mg/L Rhodamine B in water, 1 mg/L of solid and ambient air.

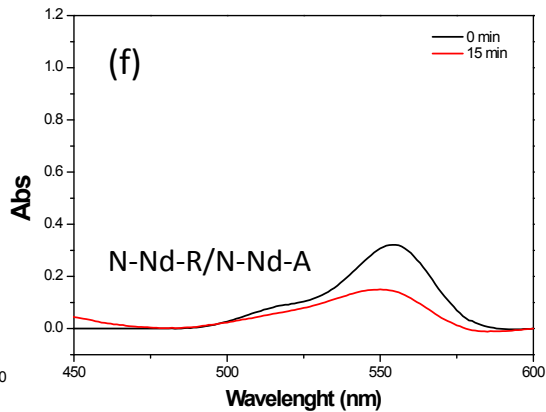
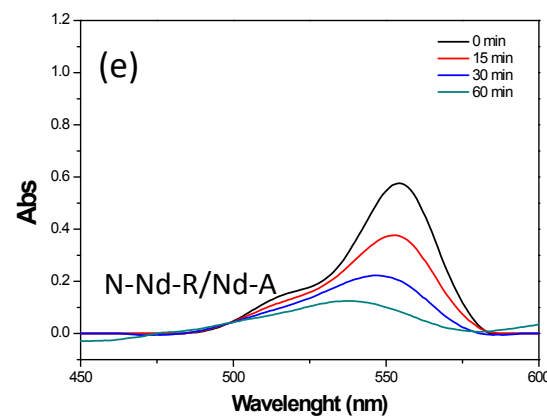
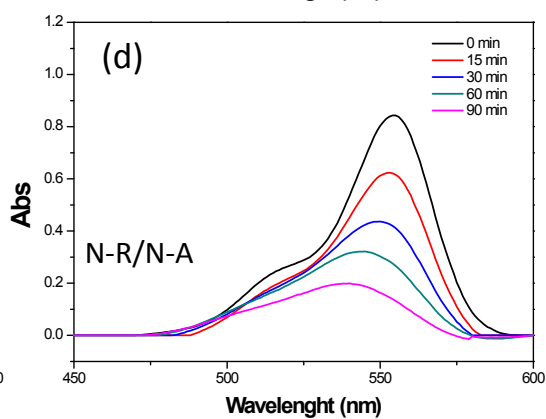
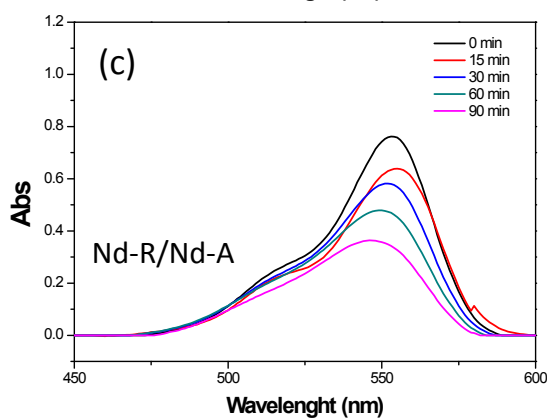
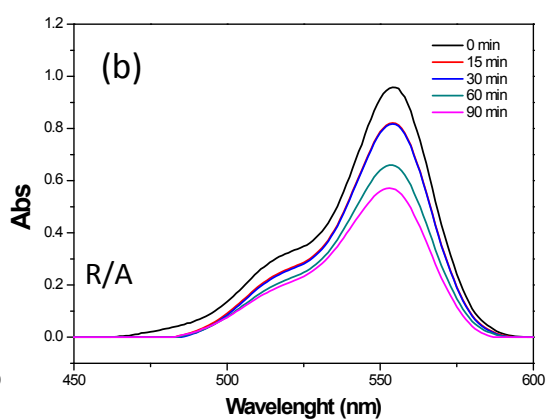
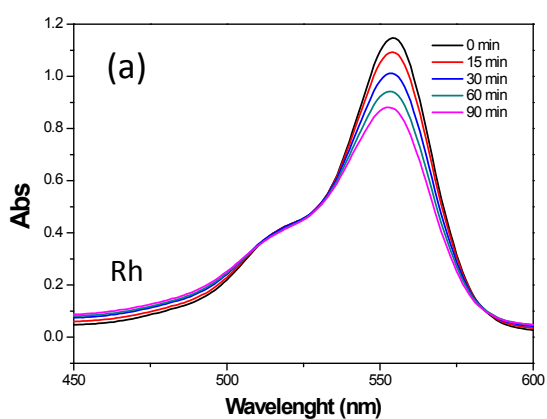


Figure S3.: Results for Rhodamine degradation; decrease in absorbance of neodymium doped samples as compared to pure titania **R/A** sample under white light. Reaction conditions: 25 °C, 5 mg/L Rhodamine B in water.

