

## Supplementary Information

### Platinum Single Atoms On Titania Aid Dye Photodegradation Whereas Platinum Nanoparticles don't

Claudio M. Pecoraro<sup>a,b+</sup>, Hanna Sopha<sup>c,d+</sup>, Siming Wu<sup>a+</sup>, Hyesung Kim<sup>a</sup>, Yue Wang<sup>a</sup>, Jan Macák<sup>c,d</sup>,  
Monica Santamaria<sup>b</sup>, Patrik Schmuki<sup>a,e\*</sup>

<sup>a</sup> Department of Materials Science and Engineering Chair for Surface Science and Corrosion (WW4-LKO) Friedrich-Alexander-Universität Erlangen-Nürnberg Martensstraße 7, 91058 Erlangen, Germany

<sup>b</sup> Dipartimento di Ingegneria, Università degli Studi di Palermo, Viale delle Scienze Edificio 6, 90128 Palermo, Italy

<sup>c</sup> Center of Materials and Nanotechnologies, Faculty of Chemical Technology, University of Pardubice, 53002 Pardubice, Czech Republic.

<sup>d</sup> Central European Institute of Technology, Brno University of Technology, 61200 Brno, Czech Republic

<sup>e</sup> Regional Centre of Advanced Technologies and Materials, Šlechtitelů 27, 78371 Olomouc, Czech Republic

<sup>+</sup> These authors contribute equally.

<sup>\*</sup> Email: [schmuki@ww.uni-erlangen.de](mailto:schmuki@ww.uni-erlangen.de)

Sample	0.005 mM Pt SA – TiO <sub>2</sub>	1 mM Pt SA – TiO <sub>2</sub>	2 mM Pt SA – TiO <sub>2</sub>	0.005 mM Pt NP – TiO <sub>2</sub>
Pt (at %)	0.24 ± 0.05	0.45 ± 0.05	0.49 ± 0.05	0.6 ± 0.05

Table S1. Loading amount of Pt on sputtered TiO<sub>2</sub> determined by XPS.

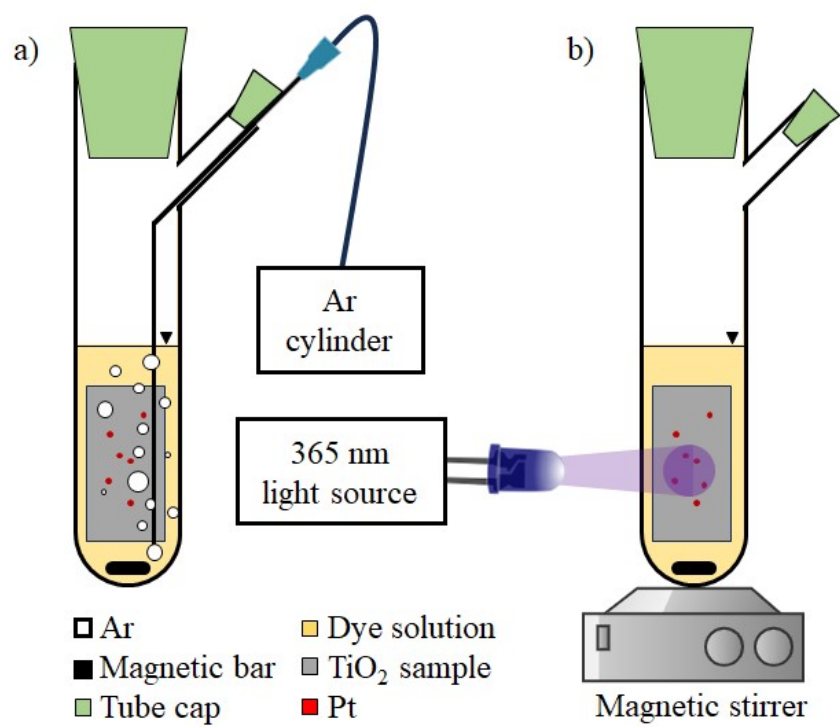


Figure S1. Schematic illustration of the setup for the photodegradation test. a) Ar purging step and b) photodegradation test.

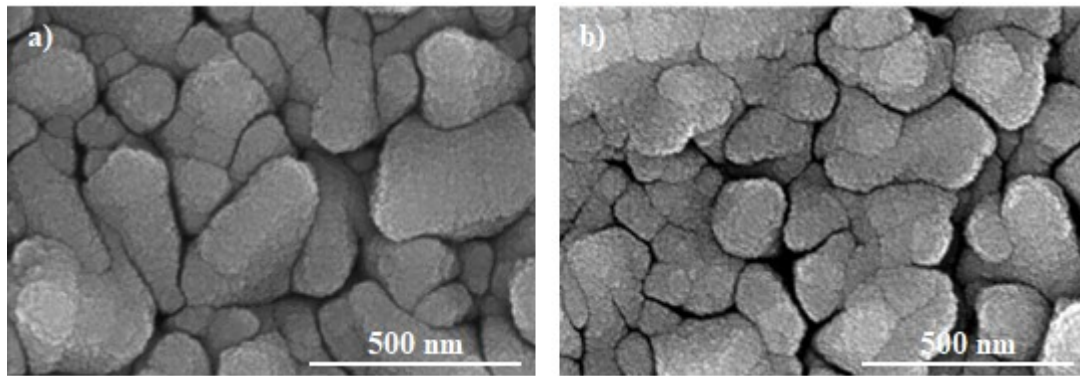


Figure S2. Top view of SEM images of a) 0.005 mM Pt SA – TiO<sub>2</sub> and b) 2 mM Pt SA – TiO<sub>2</sub>

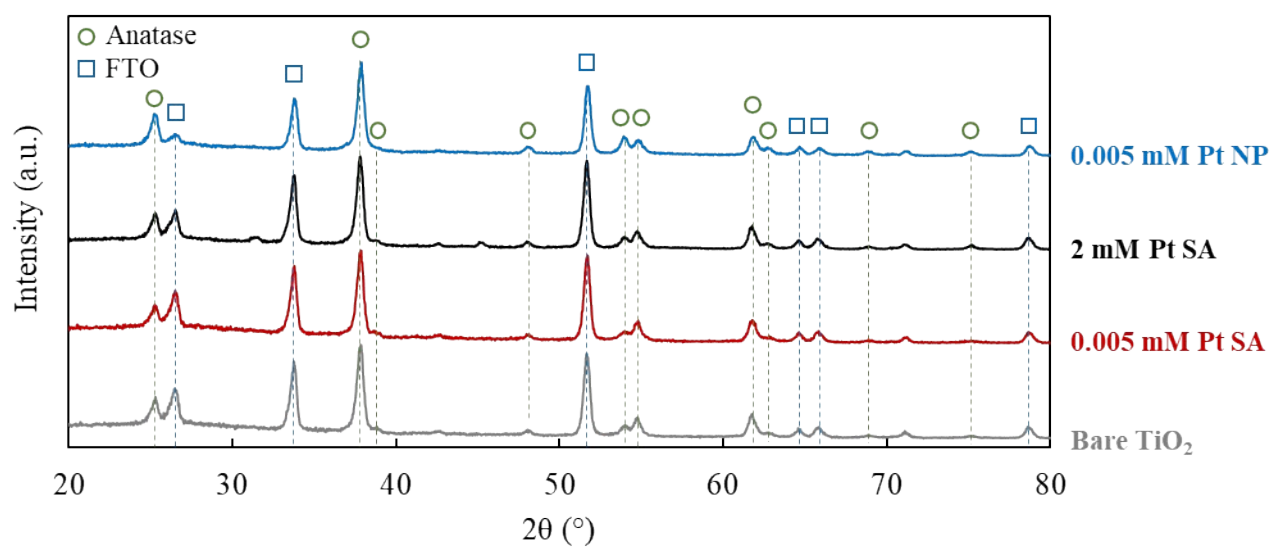


Figure S3. XRD patterns of annealed TiO<sub>2</sub> layer and TiO<sub>2</sub> layer after Pt deposition.

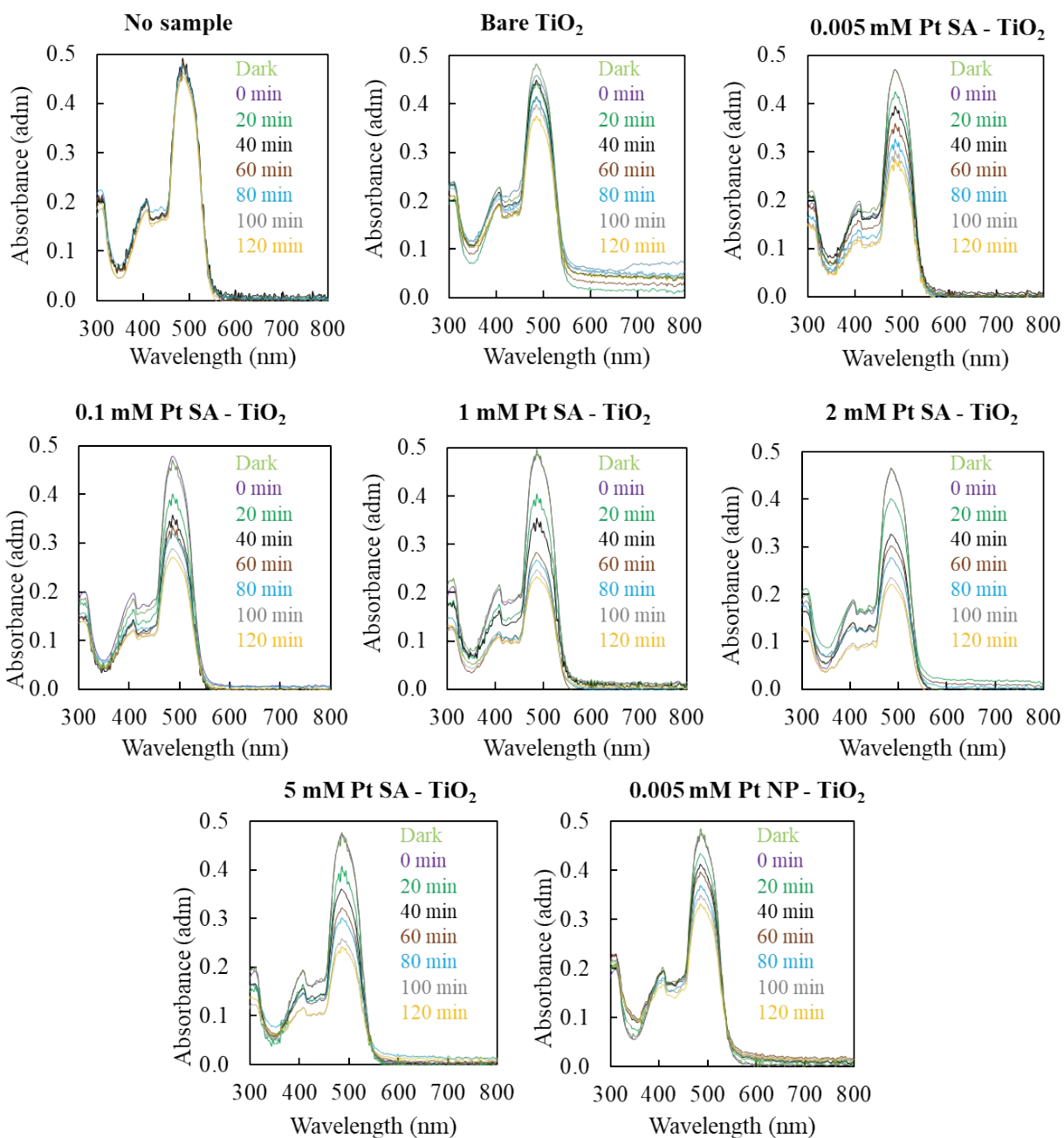


Figure S4. Absorption spectra of AO7 degradation test executed with various samples in an air atmosphere.

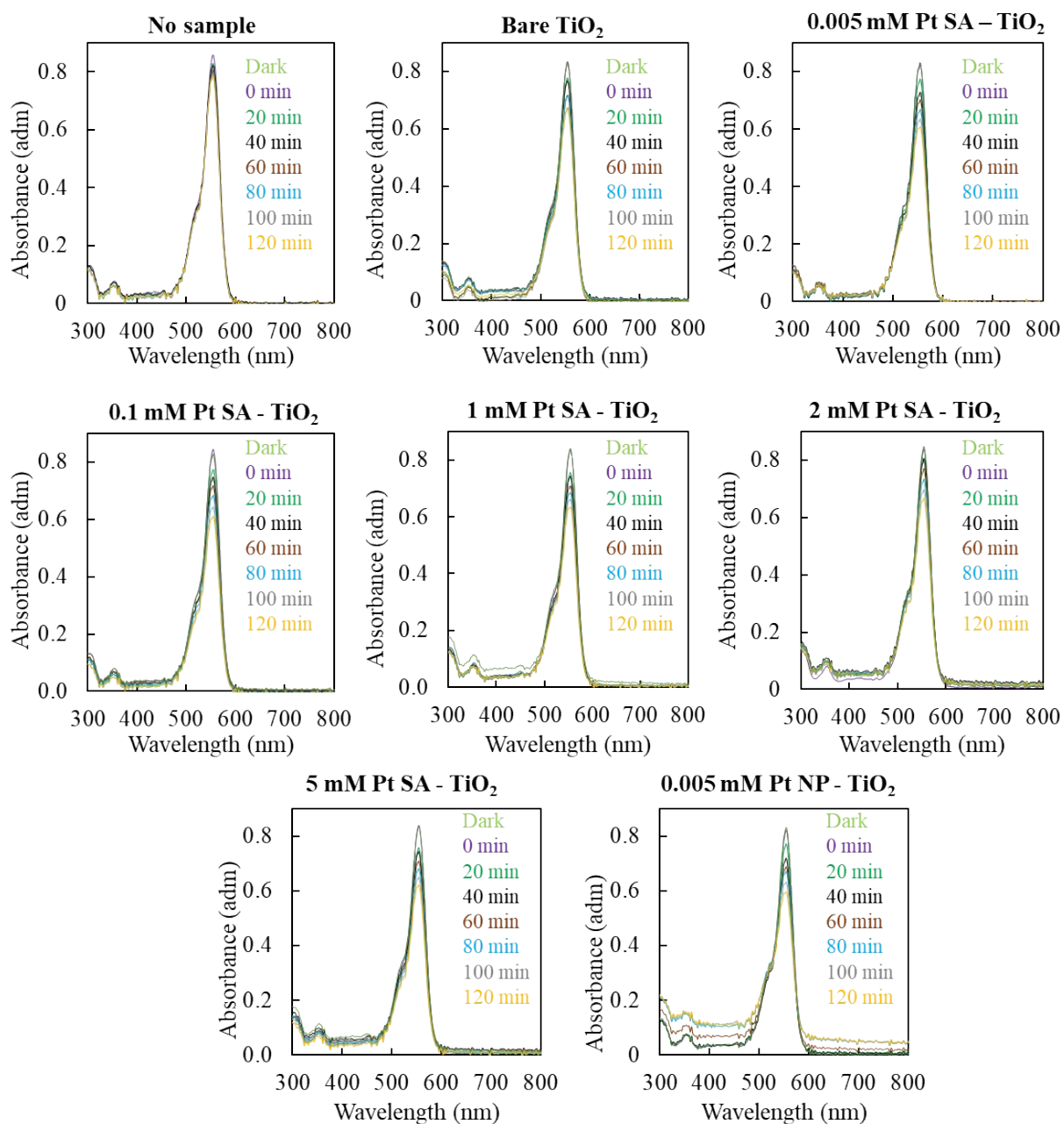


Figure S5. Absorption spectra of RhB degradation test executed with various samples in an air atmosphere.

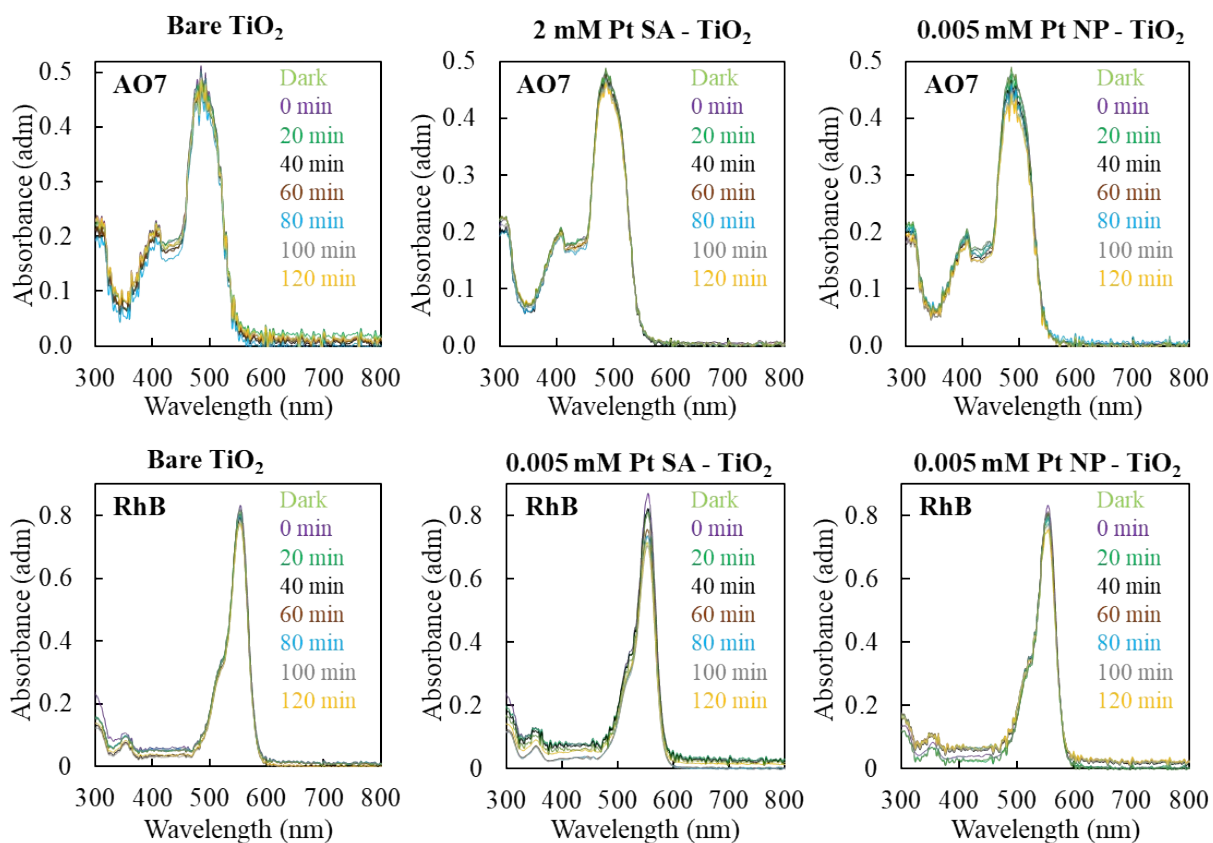


Figure S6. Absorption spectra of AO7 and RhB degradation test executed with various samples in an Ar atmosphere.



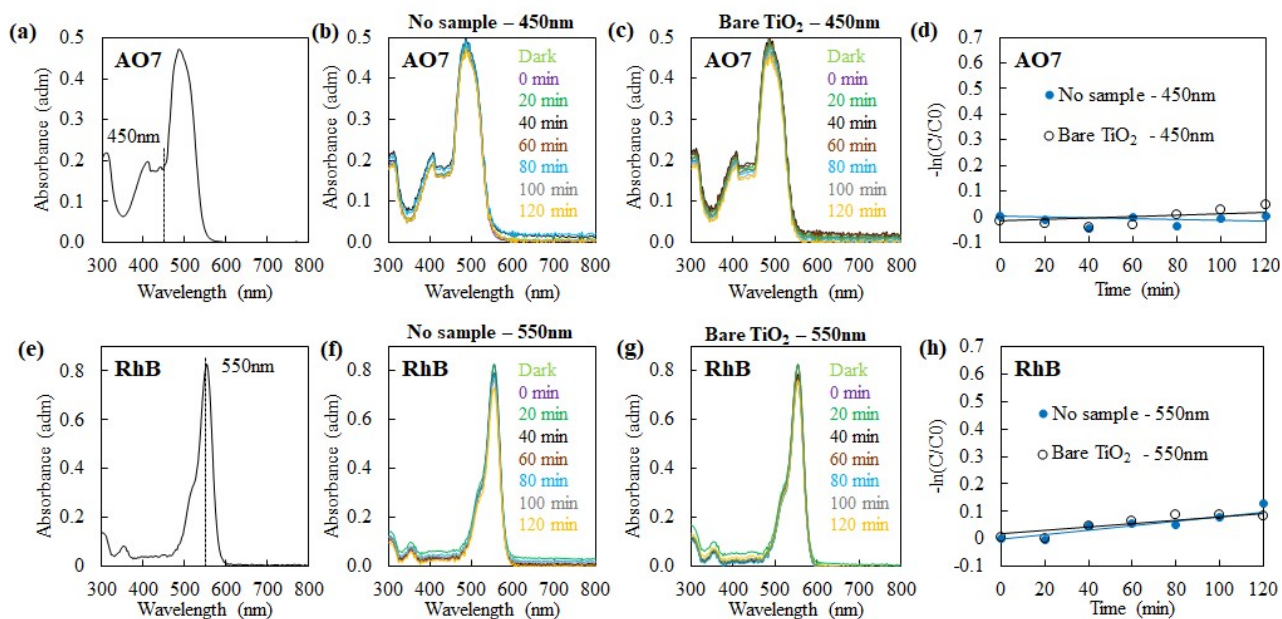


Figure S7. Examination of photofading and "photosensitization" effects. Absorption spectra of (a) AO7 and (e) RhB, (b-d) AO7 degradation test executed without and with TiO<sub>2</sub> in an air atmosphere under 450 nm. (f-h) RhB degradation test executed without and with TiO<sub>2</sub> in an air atmosphere under 550 nm.

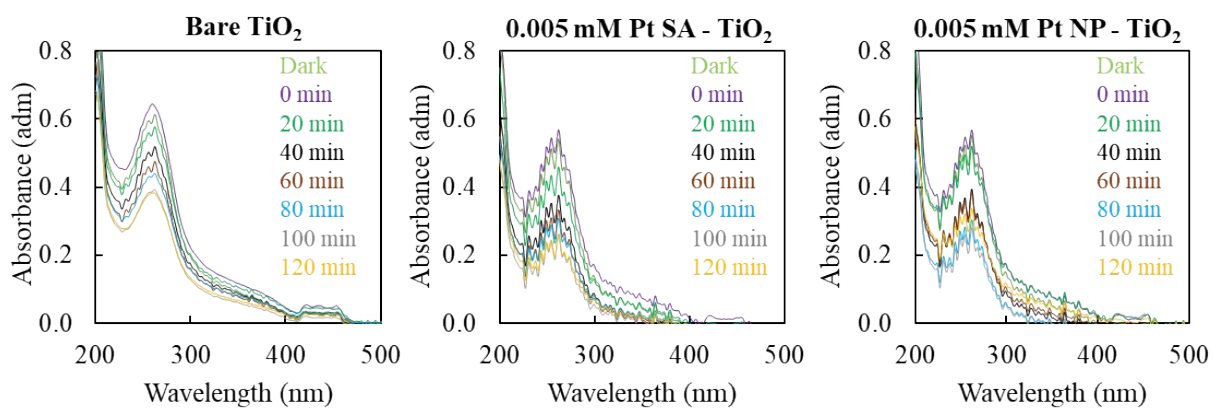


Figure S8. Absorption spectra of NBT assay executed with various samples in an air atmosphere.

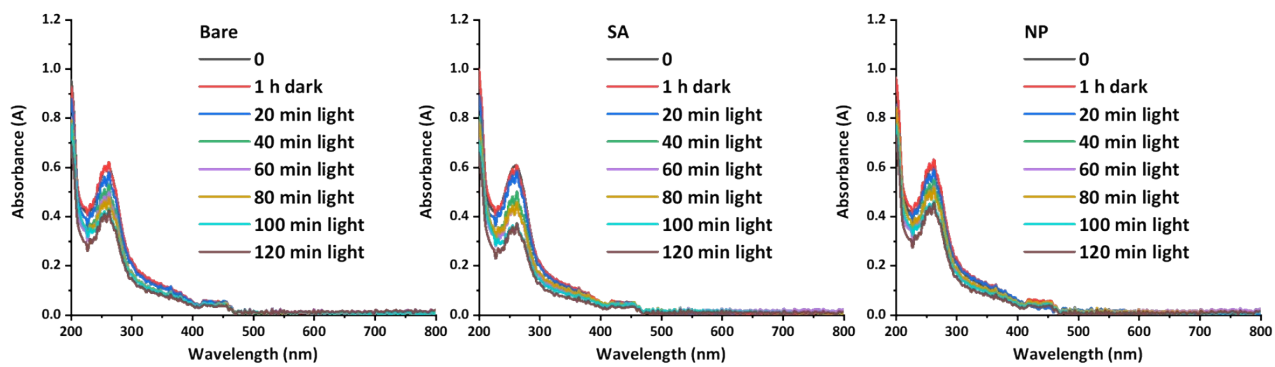


Figure S9. NBT assay executed in an Ar atmosphere with bare TiO<sub>2</sub>, 0.005 mM Pt SA TiO<sub>2</sub>, and 0.005 mM Pt NP TiO<sub>2</sub>

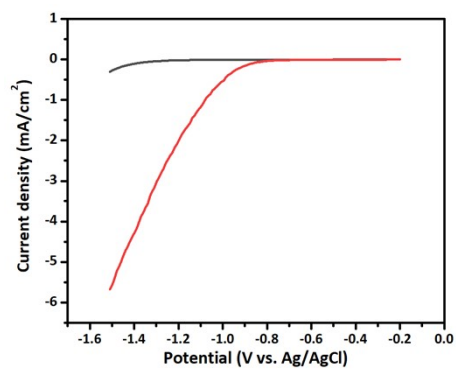


Figure S10. Linear sweep voltammetry curves carried out in 0.1 M Na<sub>2</sub>SO<sub>4</sub> electrolyte with bare TiO<sub>2</sub> (black curve) and 2 mM Pt SAs TiO<sub>2</sub> (red curve)

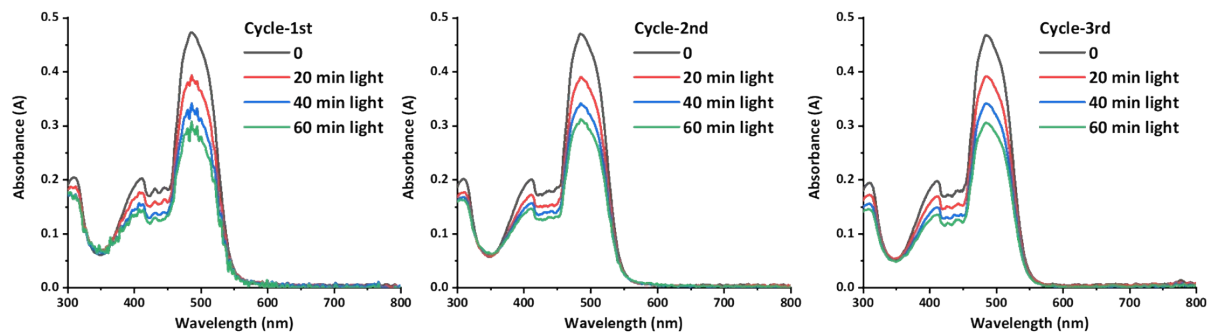


Figure S11. Cycling stability of 2mM Pt SA TiO<sub>2</sub> for AO7 degradation