Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Heterogeneous Photo-Fenton Reaction on Hematite (α-Fe_2O_3) {104}, {113} and {001} Surface Facets

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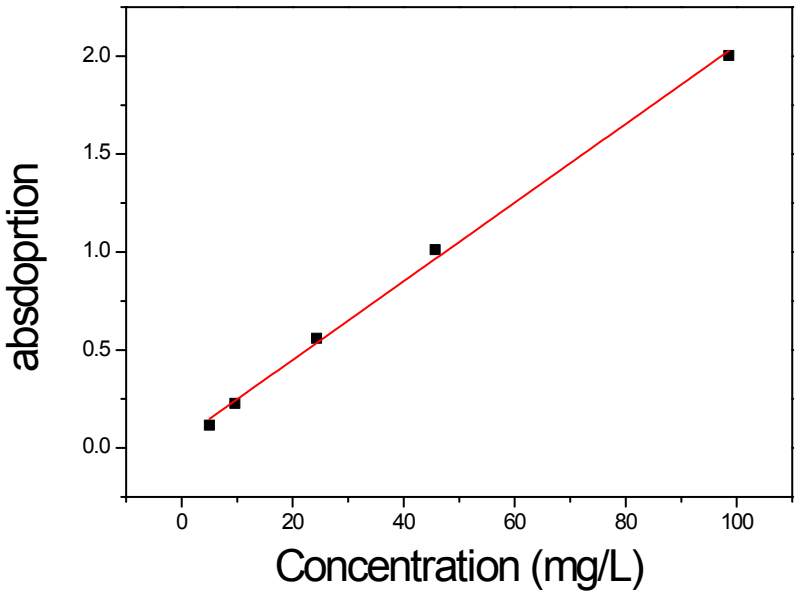

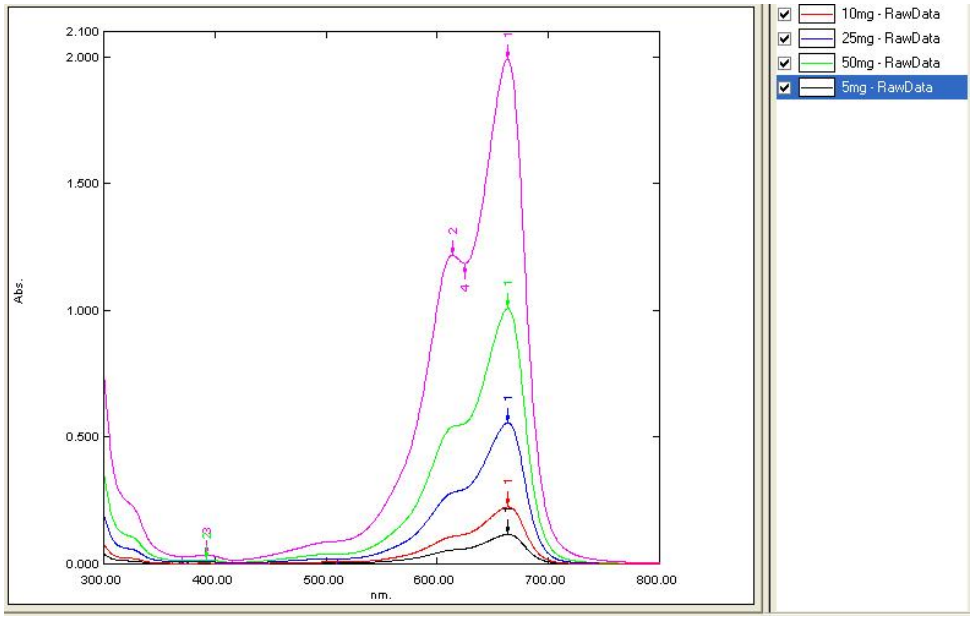

Fig. S1. Concentration of MB Vs Absorption of the solution.

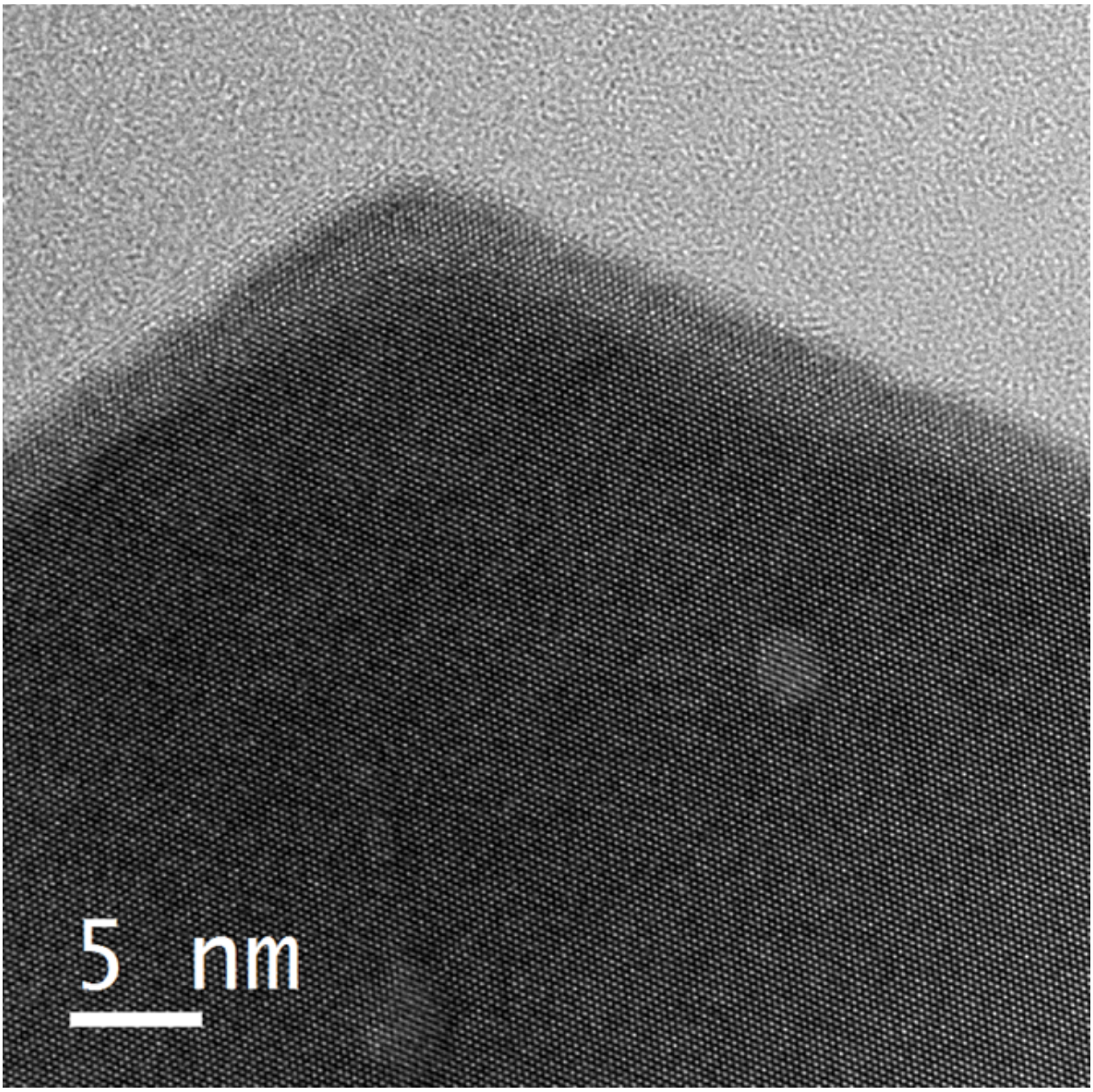

Fig. S2. HRTEM image of an α-Fe_2O_3 hexagonal nanoplate particle.

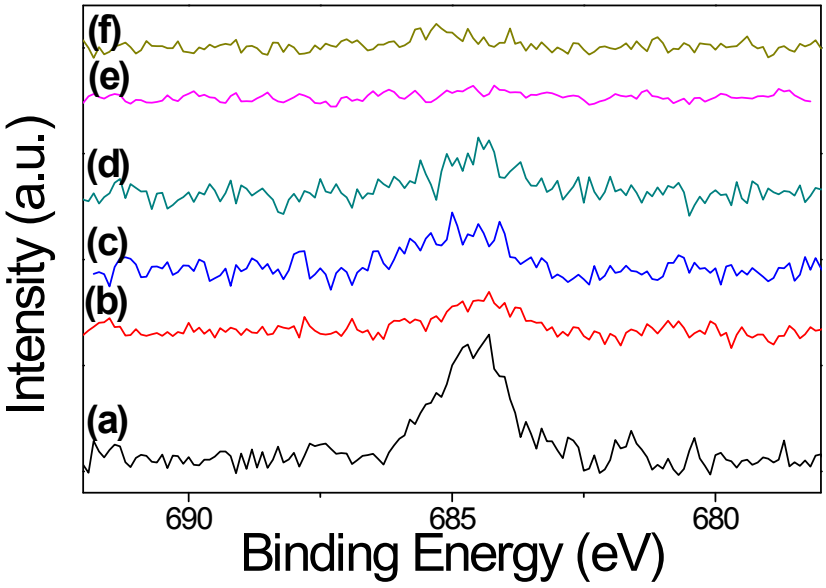

Fig. S3. F 1s XPS spectra obtained from hexagonal bipyramid particles (a) after washing 1 time with water; (b) after washing 3 times; (c) after washing 5 times; (d) after washing 7 times; (e) after wash 10 times; and (f) after calcined at 400 °C.

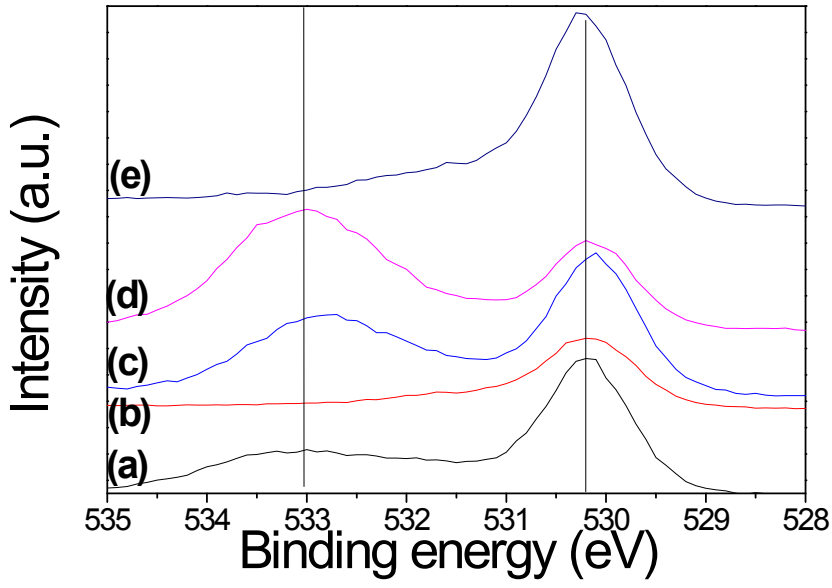

Fig. S4. O 1s XPS spectra obtained from hexagonal bipyramid particles (a) after washing 1 time with water; (b); (c) after washing 3 times; (d) after washing 5 times; (e) after washing 10 times; and (f) after calcined at 400 °C.

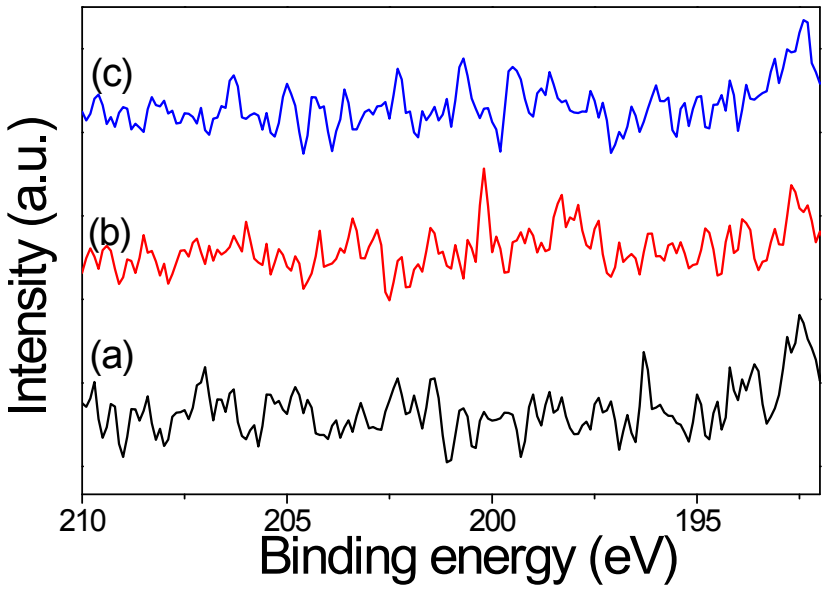

Fig. S5. Cl 2p XPS spectra obtained from (a) rhombohedral; (b) hexagonal bipyramid and (c) hexagonal bipyramid particles after calcined at 400 °C.

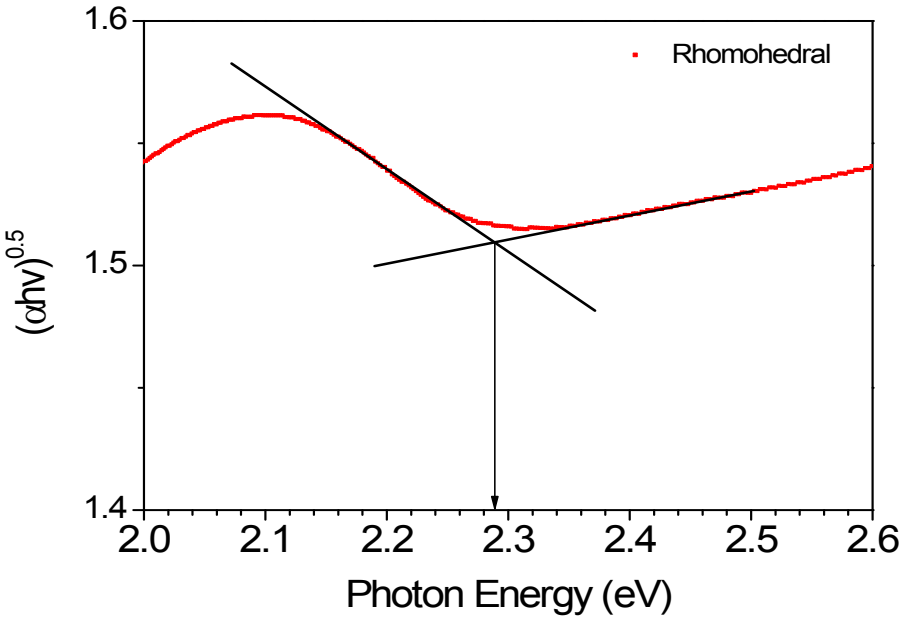

Fig. S6. Indirect optical band gap measurement of rhombohedral particles.

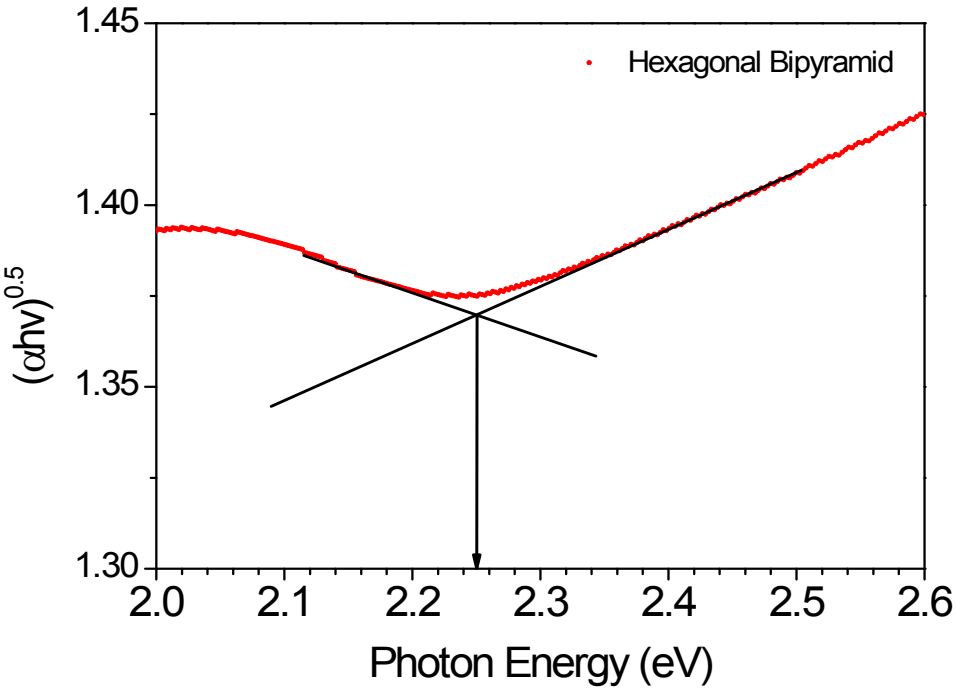

Fig. S7. Indirect optical band gap measurement of hexagonal bipyramid particles.

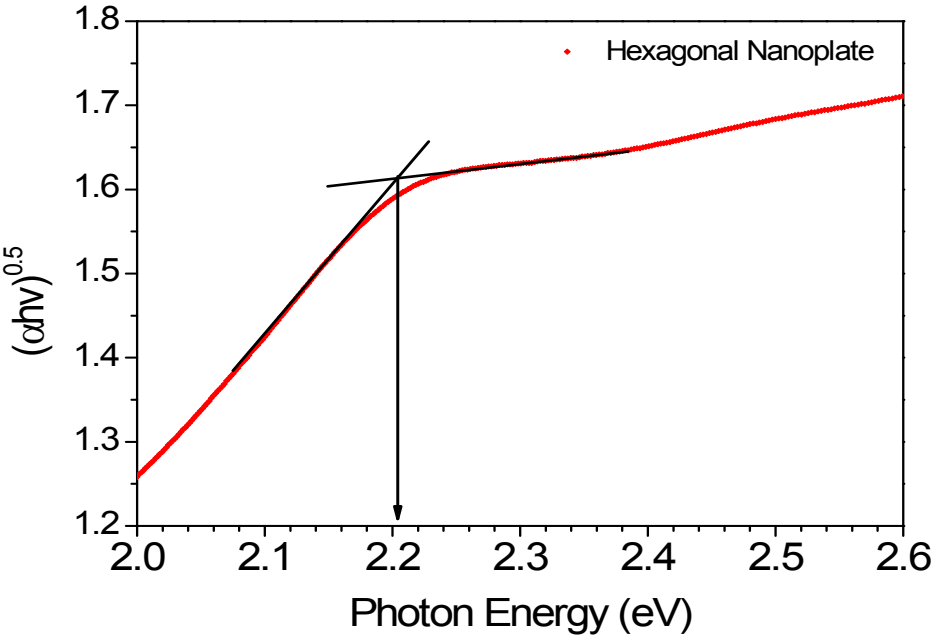

Fig. S8. Indirect optical band gap measurement of hexagonal nanoplate particles.

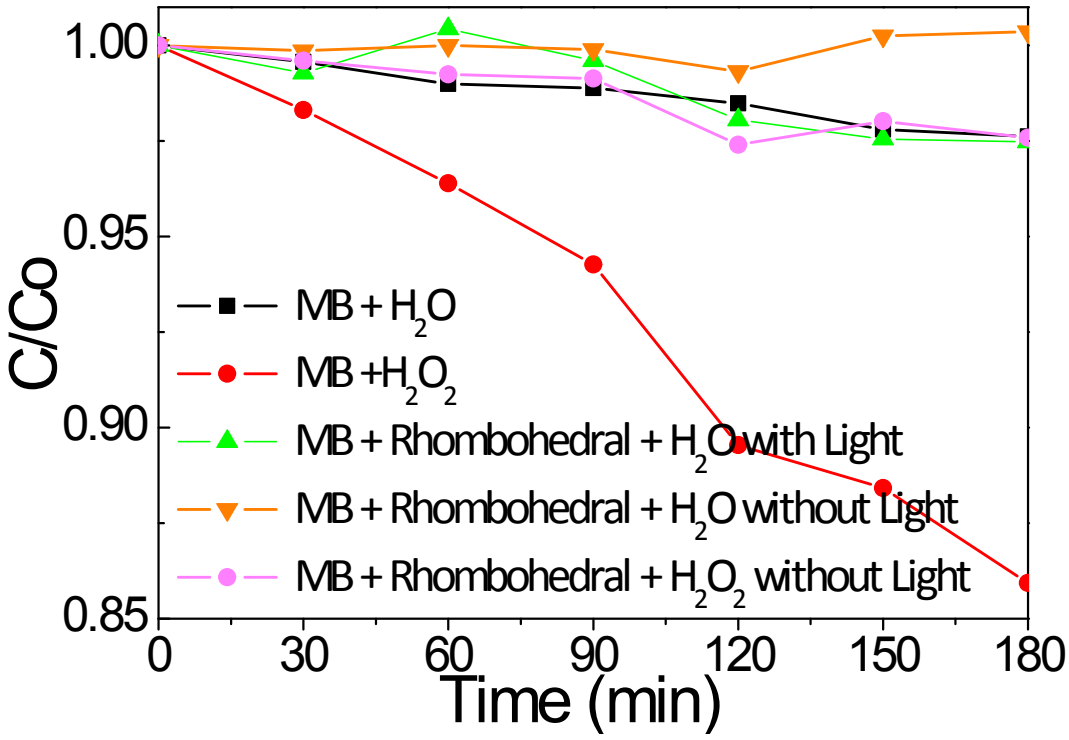

Fig. S9. Enlargement of Fig. 5 in the main manuscript. The degradation efficiency of Methylene Blue was obtained under different reaction conditions over α–Fe_2O_3 nanocrystals with a rhombohedral shape.

Two experimental conditions were performed by increasing the volume of MB solution from 15 ml to 50 mL, while H_2O_2 volume was reduced from 15 mL to 0.8 mL in the first experiment. In 2nd experiment, we have decreased the concentration of MB to 23 mg/L and volume of H_2O_2 to 0.3 mL.

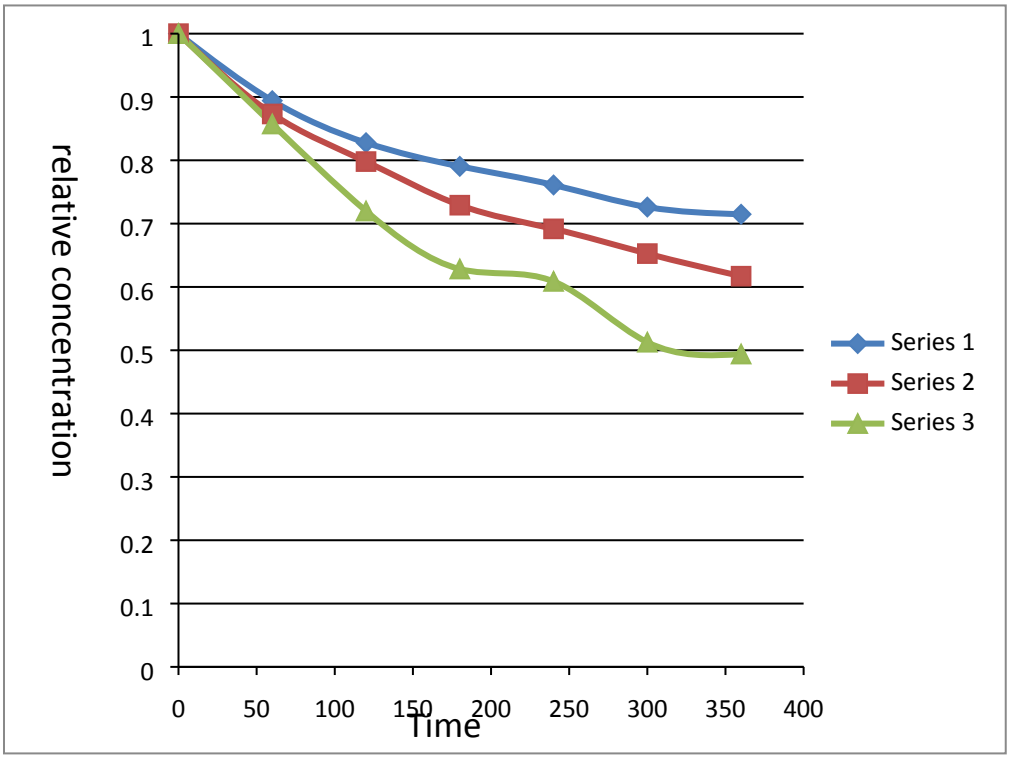

Fig. S10. Photo-catalytic degradation of Methylene Blue (blue) rhombohedron, (red) hexagonal bipyramid; (green) hexagonal nanoplate. Experimental conditions: MB concentration: 120 mg/L; 30% H2O2: 0.8 mL; reaction time 360 min.

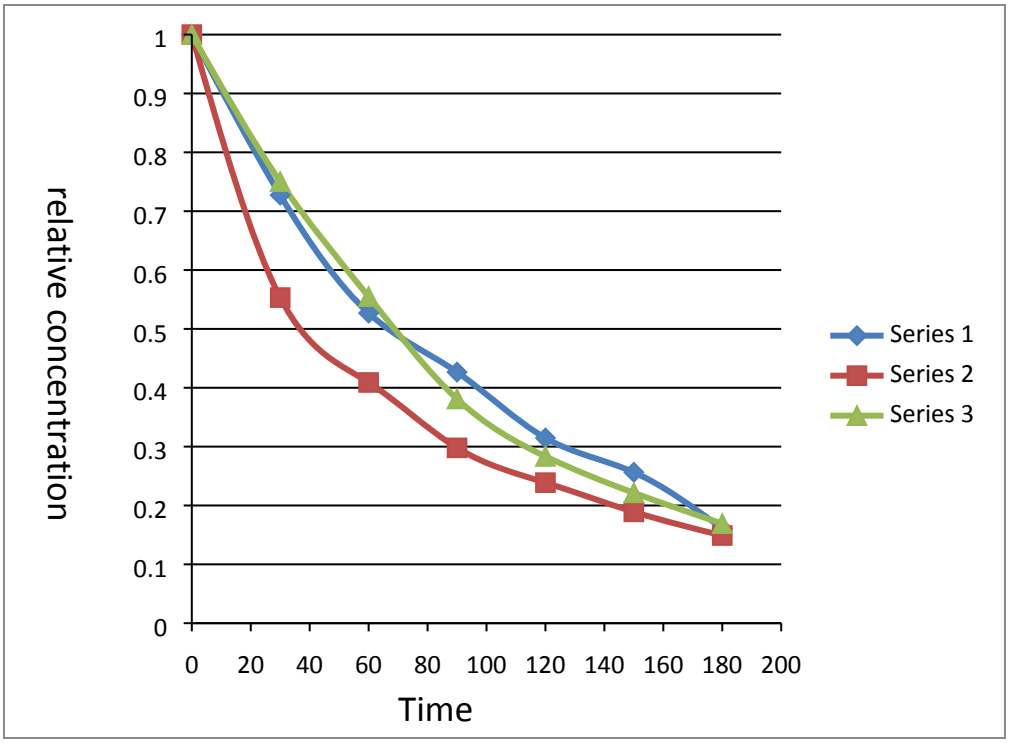

Fig. S11. Photo-catalytic degradation of Methylene Blue (blue) rhombohedron, (red) hexagonal bipyramid; (green) hexagonal nanoplate. Experimental conditions: MB concentration: 23 mg/L; 30% H_2O_2: 0.3 mL; reaction time 180 min.

The normalized reaction constants were listed below. The order of reaction sequence is in agreement with the others with difference reaction conditions. This indicates that order of activities can be repeated when we keep the same experiment conditions.

MB volume	MB concentration	30% H2O2 (mL)	Catalyst	{113}	{104}	{001}
15	50 mg/L	15	3 mg	3.7×10^{-4}	3.2×10^{-4}	1.7×10^{-4}
50	120 mg/L	0.8	10 mg	3.3×10^{-4}	1.9×10^{-4}	1.6×10^{-4}
50	23 mg/L	0.3	2 mg	1.2×10^{-2}	7.2×10^{-3}	3.3×10^{-4}