Supplementary Information

Intrinsic Peroxidase-like Activity and Enhanced Photo-Fenton Reactivity of Iron-substituted Polyoxometallate nanostructures

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Content

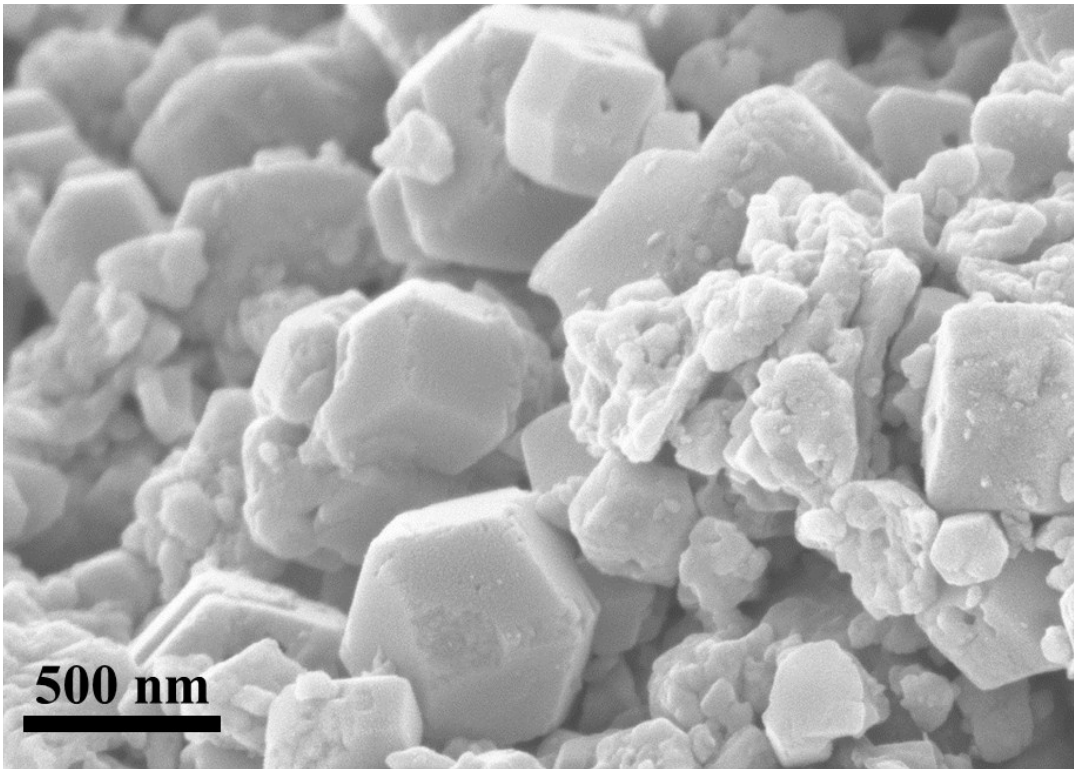

Figure S1. SEM image of as-prepared $K_3PW_{12}O_{40}$ (KPW).

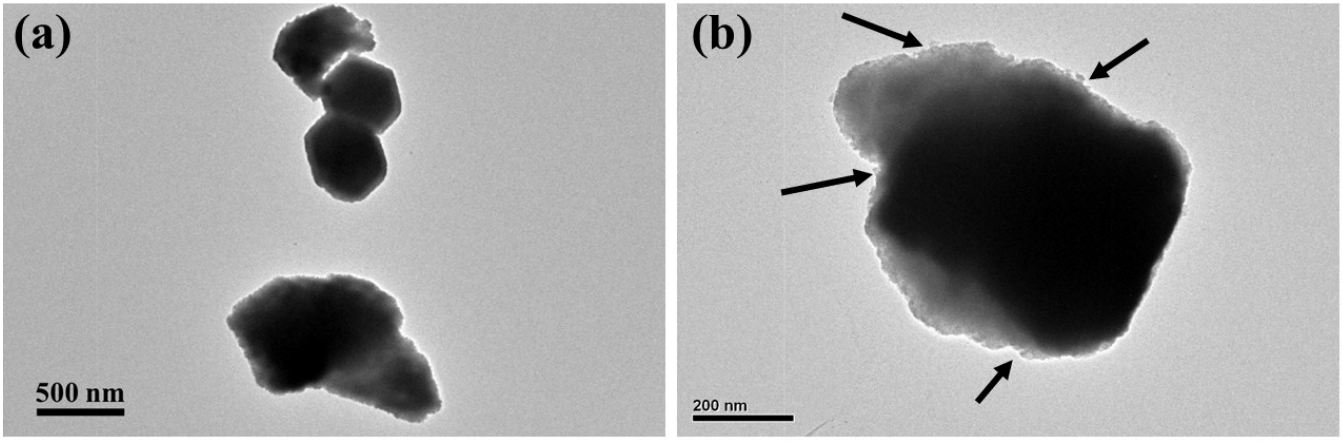

Figure S2. TEM image of as-prepared $KFePW_{12}O_{40}$ showing core-shell structure (a) and nanoparticles on the surface (b).

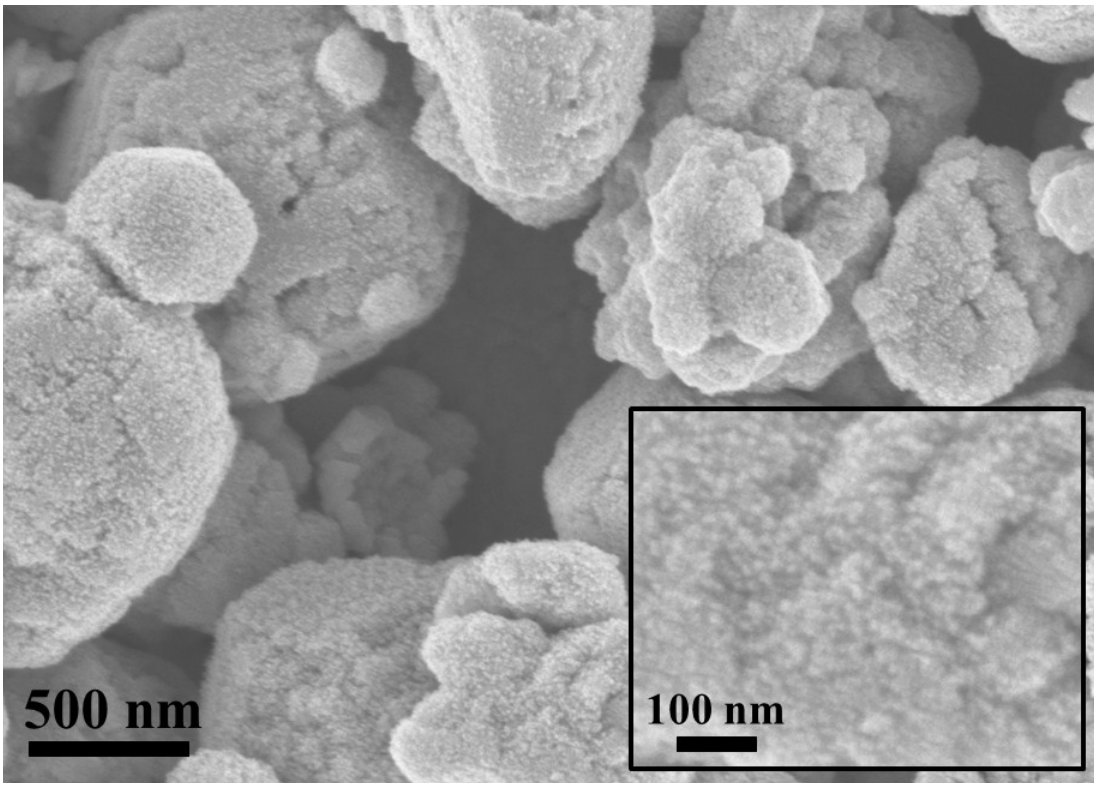

Figure S3. SEM image of $KFePW_{12}O_{40}$ (KFePW) after RhB adsorption.

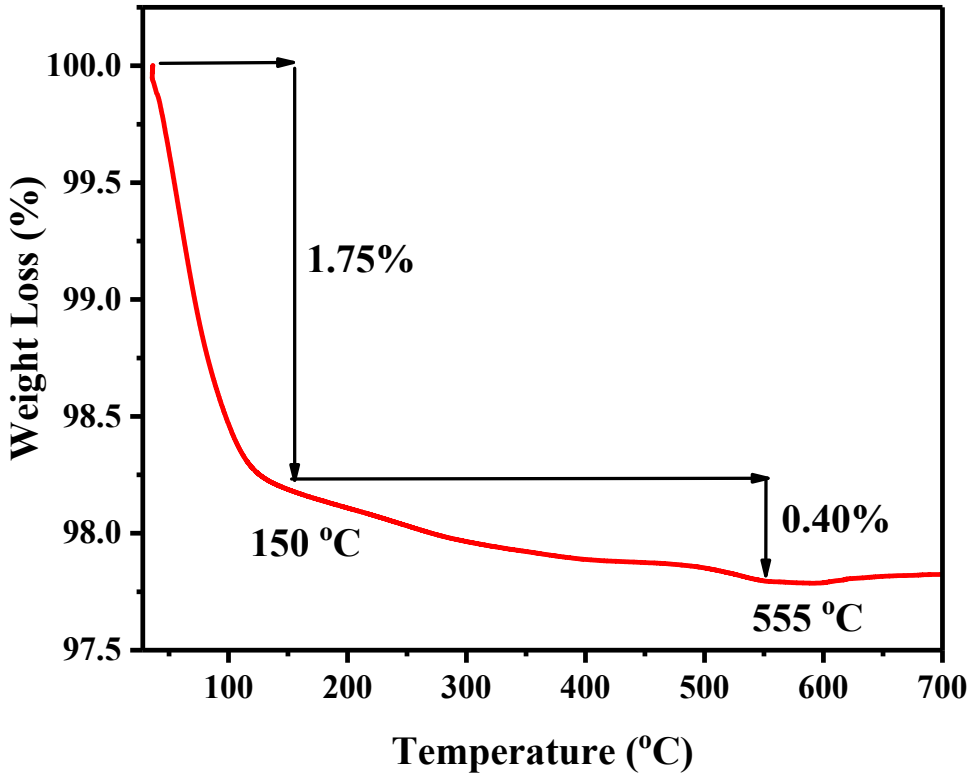

Figure S4. TGA analysis of $KFePW_{12}O_{40}$ (KFePW).

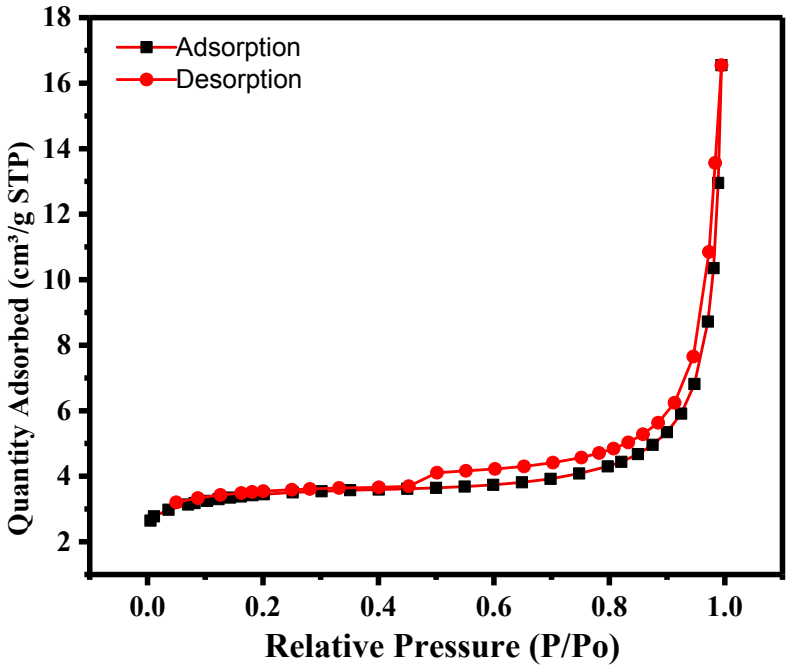

Figure S5. N2 adsorption and desorption isotherm of $K_3PW_{12}O_{40}$ (KPW).

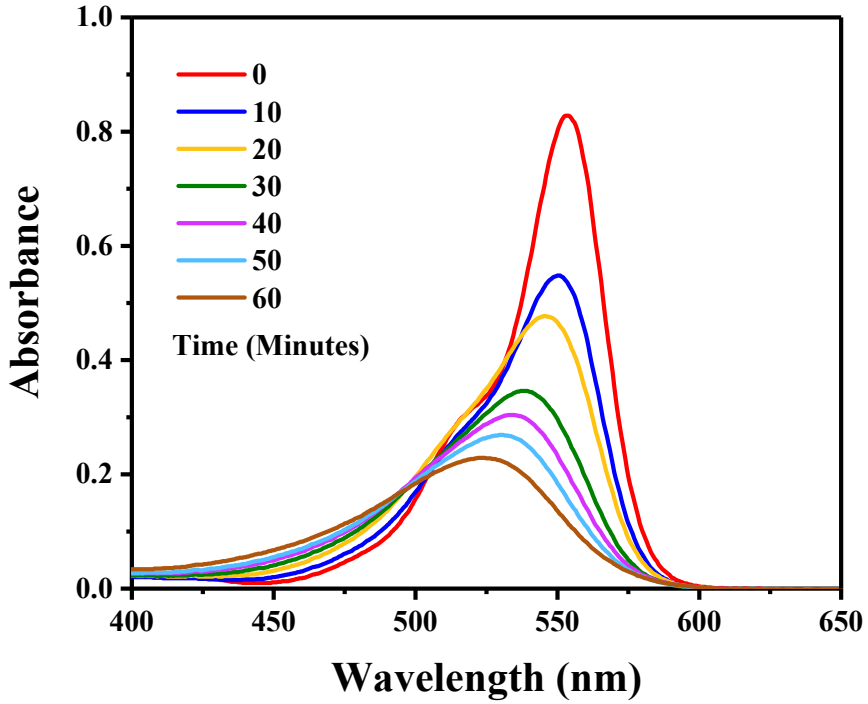

Figure S6. Temporal UV-visible absorption spectral changes observed for the RhB solutions as a function of irradiation time in KFePW solutions [catalyst] = 0.2 g L^{-1}, [H_2O_2] = 20 mM; [RhB] = 5 mM at a pH of 7.

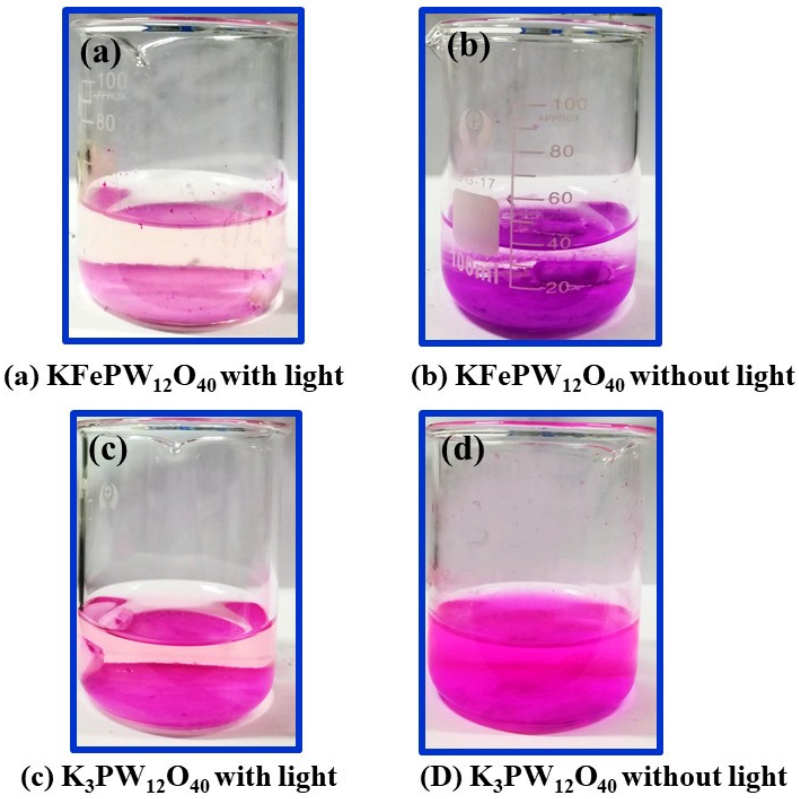

Figure S7. Photographs showing RhB solutions after 1 hour of reaction; [catalyst] = 0.2 g L^{-1}, [H_2O_2] = 20 mM; [RhB] = 5 mM at a pH of 7.

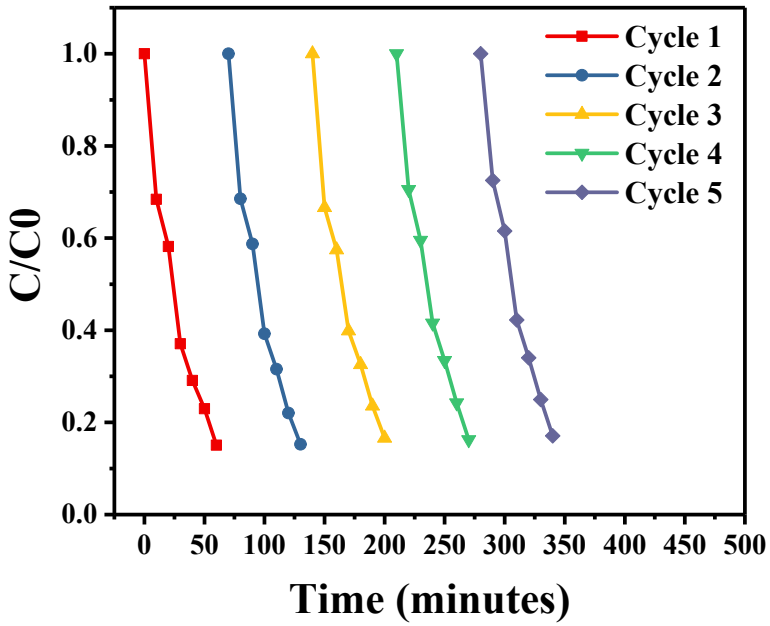

Figure S8. KFePW recycle in repetitive degradation of RhB; [catalyst] = 0.2 g L^{-1}, [H_2O_2] = 20 mM; [RhB] = 5 mM at a pH of 7.

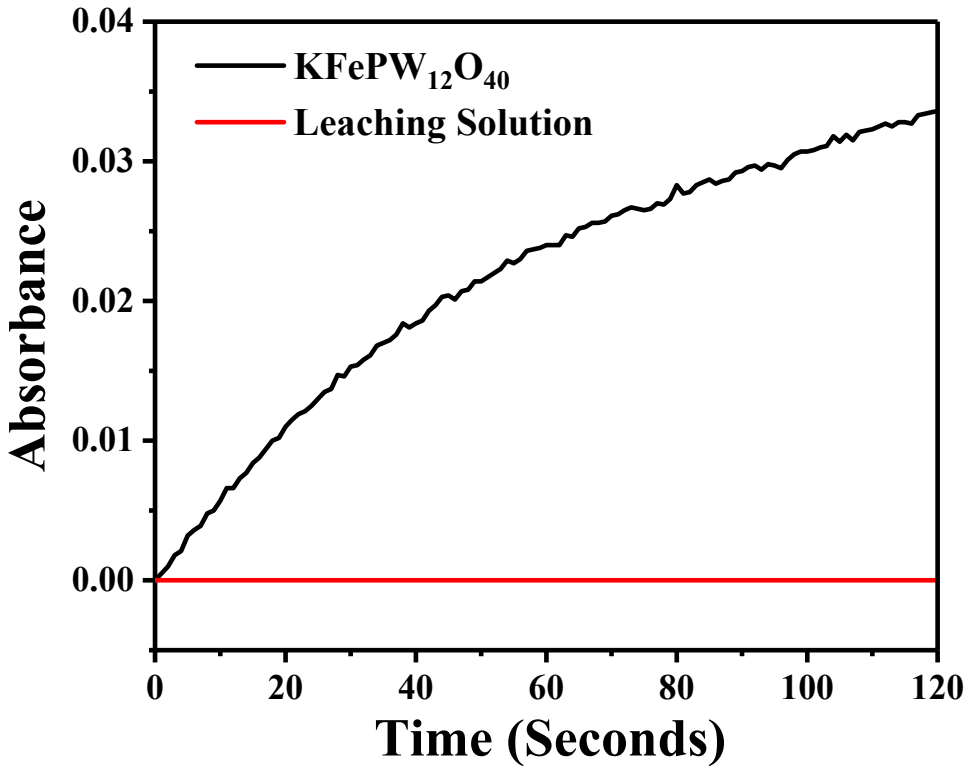

Figure S9. Demonstration that the peroxidase-like activity of KFePW does not result from iron ion leaching.

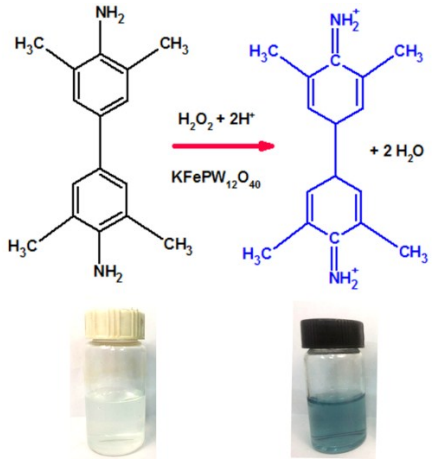

Figure S10. Schematic presentation of TMB oxidation. Photographs show the color change of solution before (left) and after (right) 5 min reaction.

Table S1 Comparison of the kinetic constant (min^{-1}) of KFePW and KPW in different reaction systems

	KWP	KWP+H_2O_2	KFePW	KFePW+H_2O_2
In Dark	0.0039	0.0036	0.0073	0.0116
In Light	0.0041	0.0042	0.007	0.0305

Table S2 Comparison of the catalytic activities of KFePW and other similar materials for degradation of RhB in different conditions

Catalyst	**H_2O_2 conc. mM**	**RhB conc. (ppm)**	**Catalyst amount (g/L)**	**pH**	**Degradation rate (min^{-1})**	**Reference**
$KFePW_{12}O_{40}$	38	10	0.05	Neutral	0.0305	*This study*
$K_3PW_{12}O_{40}$	38	10	0.05	Neutral	0.0042	*This study*
nanosphere α-Fe_2O_3	-	100	-	Neutral	0.0133	*1*
Fe_3O_4	90	10	0.05	Neutral	0.0105	*2*
Pt loaded C-$ZnFe_2O_4$	$5x10^3$	5	0.04	Neutral	9.31	*3*
VO_x	20	10	0.2	Neutral	5.79	*4*
Fe_3O_4/g-C_3N_4 NC	90	10	0.05	Neutral	0.02	*2*
$H_3PW_{12}O_{40}/SiO_2$	-	10	0.05	2.5	0.03	*5*
HPW@ MIL-53(Fe)	-	20	0.02	Neutral	0.0141	*6*
$[Co_2(4,4'\text{-bpy})](4,4'\text{-obb})_2$	-	100	2	Neutral	0.013	*7*
$[Ni_2(4,4'\text{-bpy})_2](4,4'\text{-obb})_2 \cdot H_2O$	-	100	2	Neutral	0.008	*7*
$[Zn_2(4,4'\text{-bpy})](4,4'\text{-obb})_2$	-	100	2	Neutral	0.007	*7*

References

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