nanomaterials

MDPI

Supplementary Material

Oxygen Vacancy-Mediated Activates Oxygen to Produce Reactive Oxygen Species (ROS) on Ce-Modified Activated Clay for Degradation of Organic Compounds without Hydrogen Peroxide in Strong Acid

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Supplementary Figures

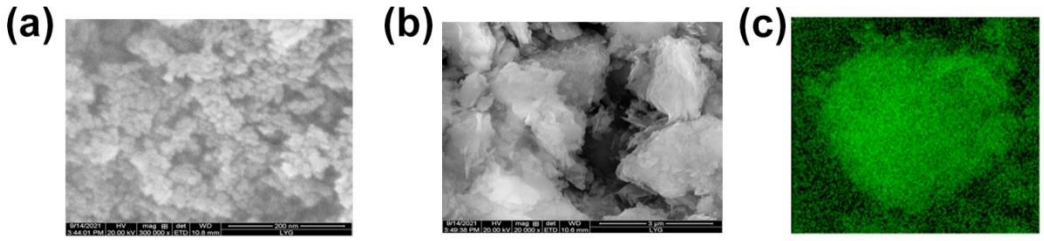


Figure S1. SEM images of CeO_2（**a**）， Acid treated clay (**b**). EDS compositional mapping of O (**c**).

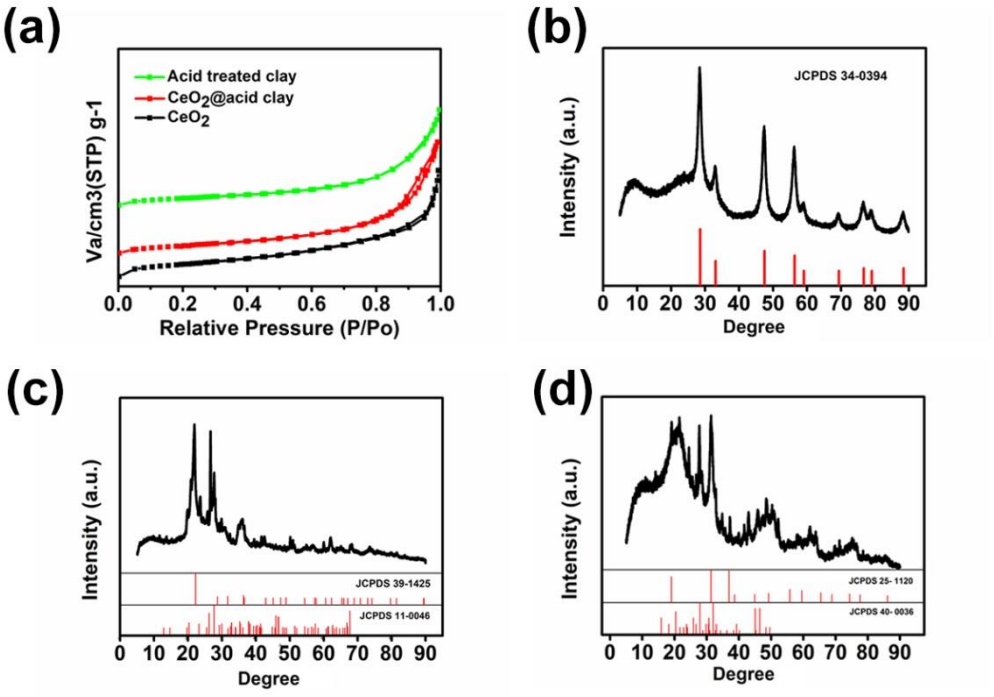


Figure S2. N_2 adsorption/desorption isotherms of CeO_2, acid treated clay and CeO_2@acid clay (**a**). XRD patterns of the CeO_2 (**b**), Acid treated clay (**c**) and CeAY(**d**).

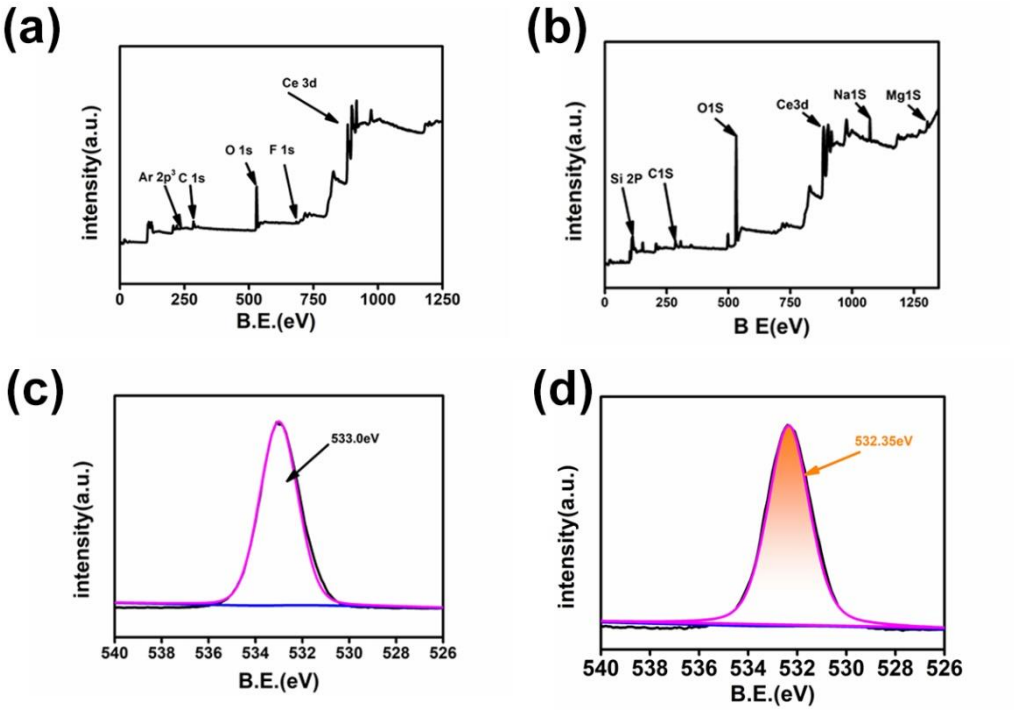


Figure S3. The XPS survey spectrum of CeO_2 (**a**) and CeO_2@acid clay (**b**). The O1s of Acid treated clay (**c**). The O1S XPS patterns of CeAY after degradation of MO (**d**).

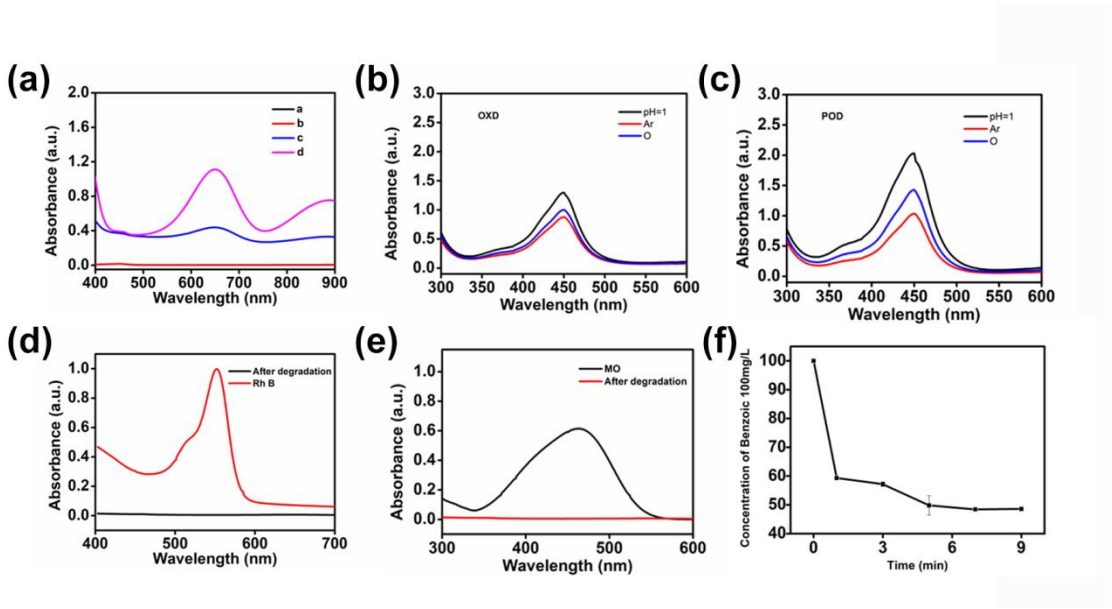


Figure S4. The catalyze activity of the CeO_2, a)TMB; b)TMB + H_2O_2; c)CeO_2 + TMB; d)CeO_2 + TMB + H_2O_2 (**a**). The effort of the oxygen, argon to the catalyze activity of CeAY (**b**,**c**). The degradation result of Rh B, MO and Benzoic acid (CeAY 2 mg mL^{-1}, room temperature pH = 1, 5 mg L^{-1}) (**d**–**f**).

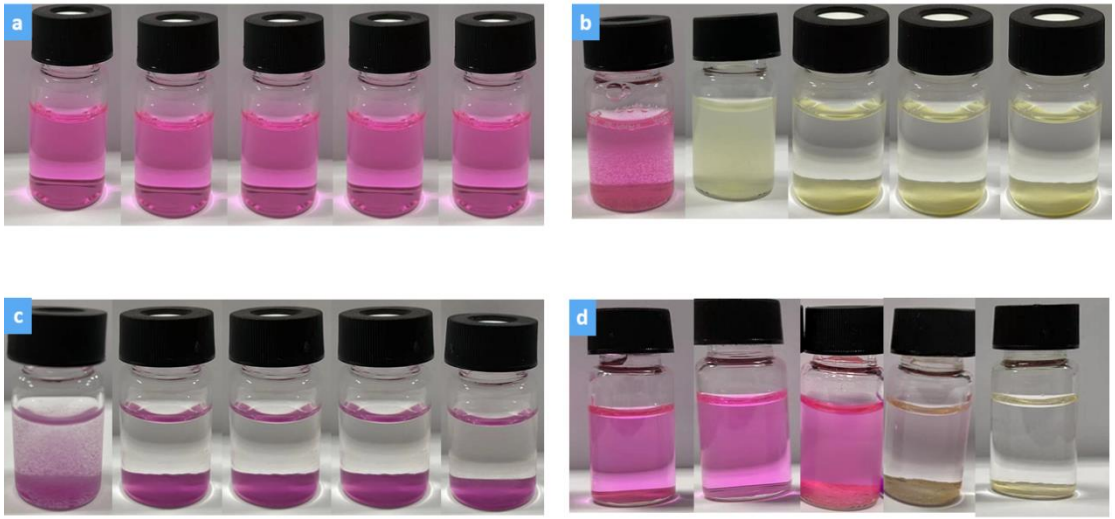


Figure S5. The degradation effect of the Rh B with time increased (a, pH = 7.0, after adding the CeO_2 and CeAY; b, pH = 1.0, after adding the CeAY; c, the acid-treated clay adsorbs Rh B to the bottom of the solution; d, pH = 1.0, after adding the CeO_2 for two weeks).

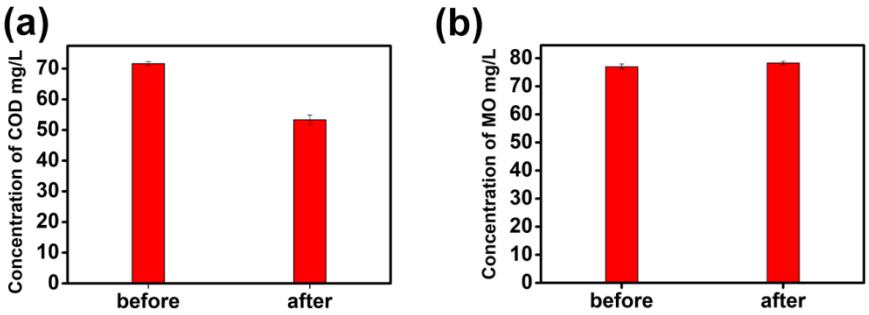


Figure S6. The Concentration of COD before and after degradation (a, Rh B; b, MO).

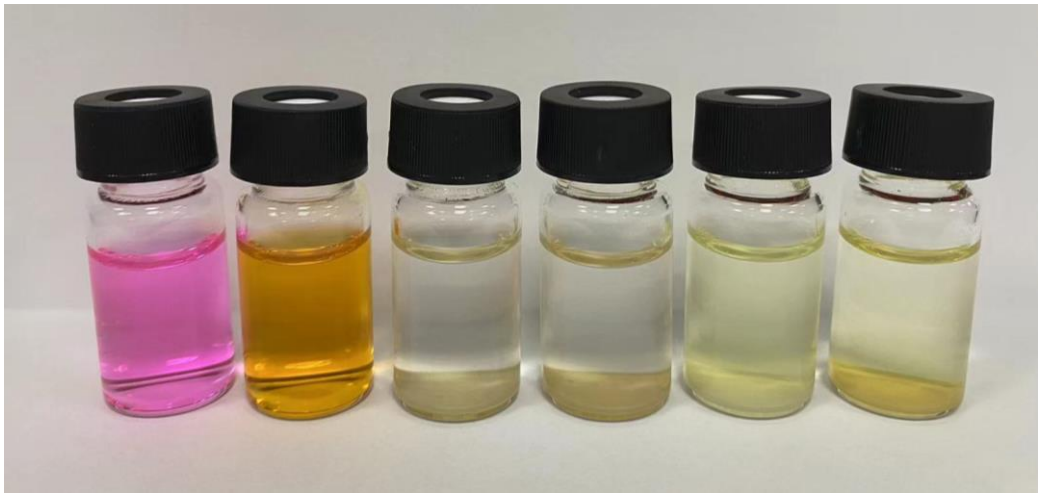


Figure S7. The degradation effect of Rb B and MO at different pH and different strong acid.

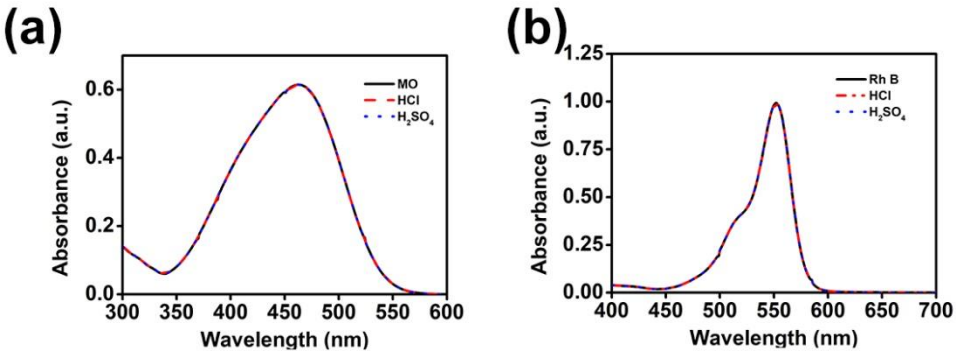


Figure S8. The effect of add HCl and H_2SO_4 on the degradation of Mo and Rh B (a, MO; b, Rh B).

Supplementary Tables

Table S1. The main components of bentonite.

component	SiO_2	Al_2O_3	Fe_2O_3	FeO	TiO	CaO	MgO	MnO	K_2O	Na_2O	P_2O_5
content	61.74	16.08	3.19	0.27	0.15	5.01	3.19	0.29	1.00	0.22	0.03

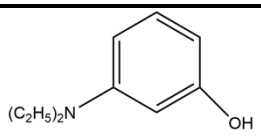
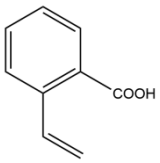
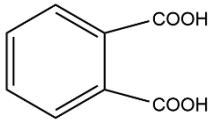
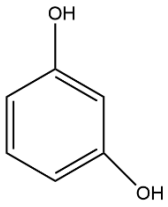
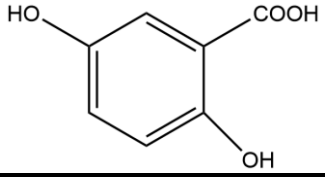
Table S2. The specific surface area of different materials.

Sample	Surface area(m^2g^{-1})
CeO_2	2.6143
Acid treated clay	68.641
CeO_2@acid clay	94.463

Table S3. The Michaelis-Menten constant (Km) and maximum reaction rate (Vmax) of the as-obtained CeAY with TMB as the substrate.

Catalyst	Substance	K_m (mM)	V_{max}(10^{-7}M/s)	References
CeAY	TMB	0.3412	0.0127	This work
CeO_2	TMB	1.5	0.69	[1]
isPNC	TMB	3.8	7	[2]
swPNC	TMB	1.9	6	[2]
isDNC	TMB	1.8	5	[2]
swDNC	TMB	0.8	3	[2]
HRP	TMB	0.43	1	[3]
Cu-Cys@COF-OMe	TMB	0.75	1.01	[4]
CH-Cu	TMB	0.58	4.56	[5]

Table S4. Degradation intermediates of RhB in the CeAY system.

Relative molecular mass	Structure
165	
148	
230	
110	
218	

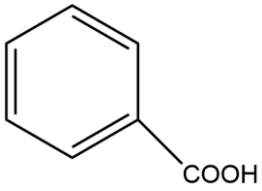
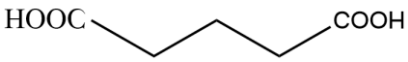
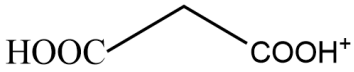
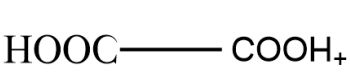
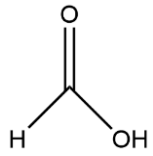
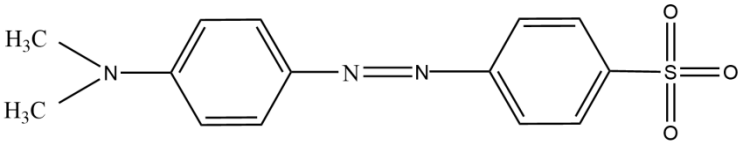
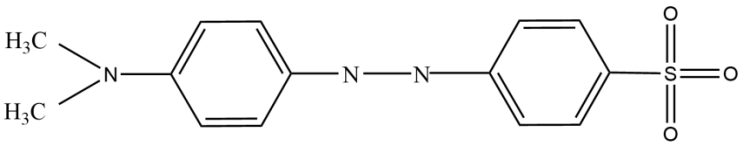
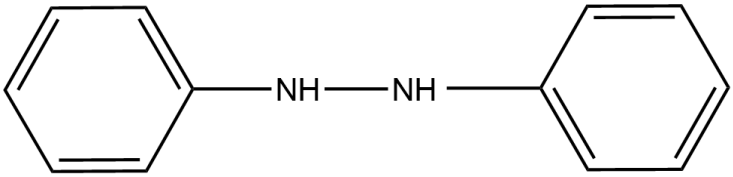
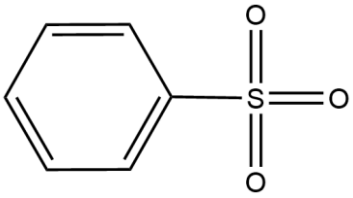
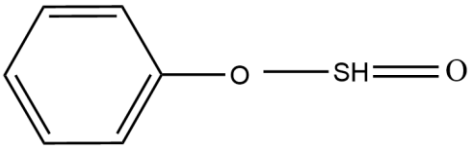
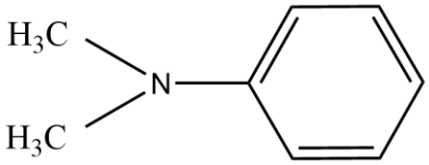
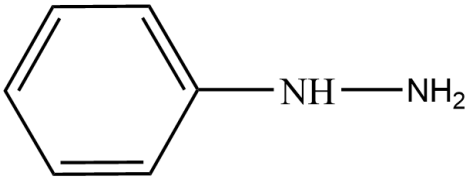
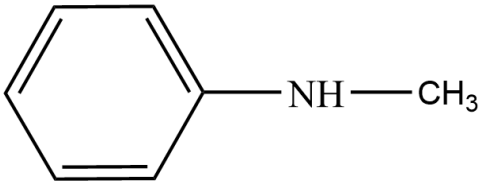
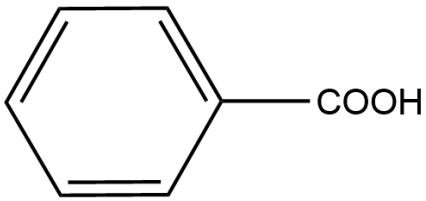
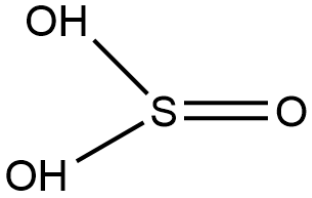
154	
196	
168	
154	
46	

Table S5. Degradation intermediates of RhB in the CeAY system.

Relative molecular mass	Structure
304	
306	
184	
157	
142	

121	
108	
107	
102	
82	

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