Electronic supplementary information

Surface defect engineered CeO_{2-x} by ultrasound treatment for superior photocatalytic H_2 production and water treatment

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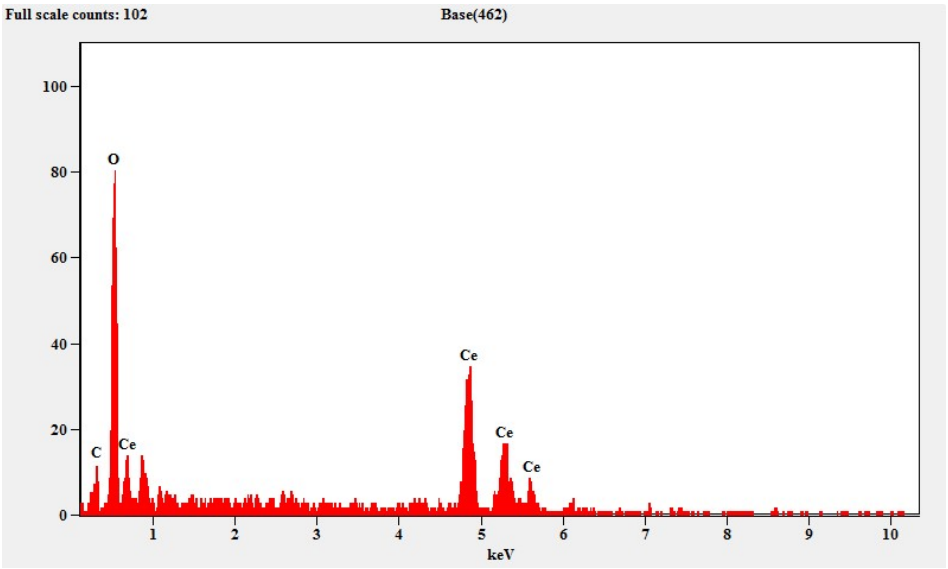

Figure S1. EDAX study of U-Ceo_{2-x} sample.

Table S1. Relative surface concentration of Ce^{3+} and oxygen vacancy based on XPS analysis.

Catalyst	Ce^{3+}%	Ce^{4+}%	O_c%	H_2 production (μmol h^{-1} g^{-1})	BB degradation (in %)	Phenol degradation (in %)
CeO_2	54.44	45.56	-	950	44	39
U-CeO_{2-x}	59.54	40.46	15.64	2570	95.2	94.5

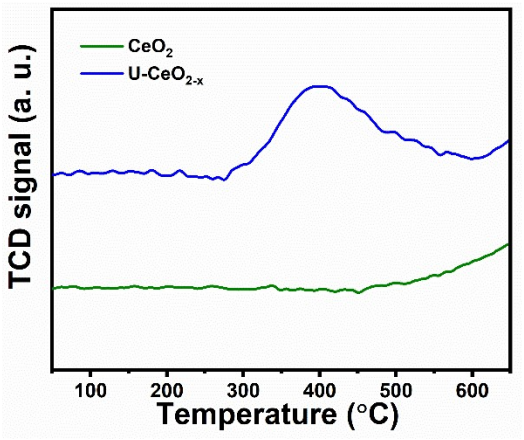

Figure S2. TPR spectra of the synthesized samples.

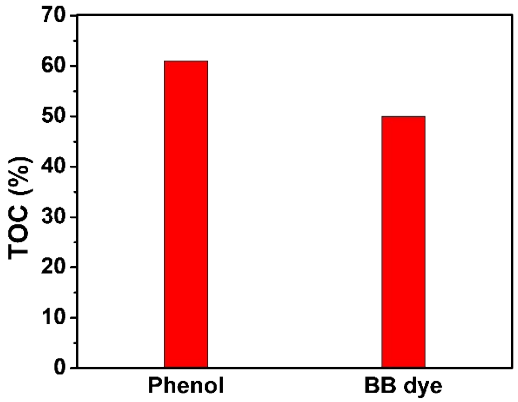

Figure S3. TOC analysis of the BB dye and phenol.

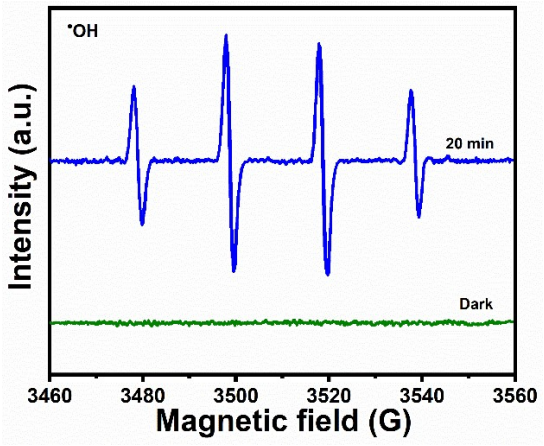

Figure S4. ESR spectra detecting •OH in the presence of DMPO in water.

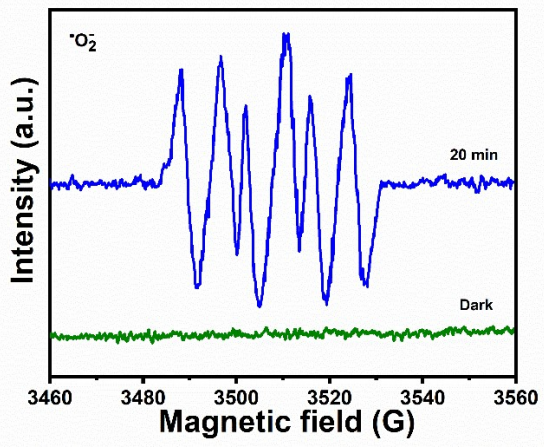

Figure S5. ESR spectra detecting $^{\bullet}O_2^-$ in the presence of DMPO in methanol.

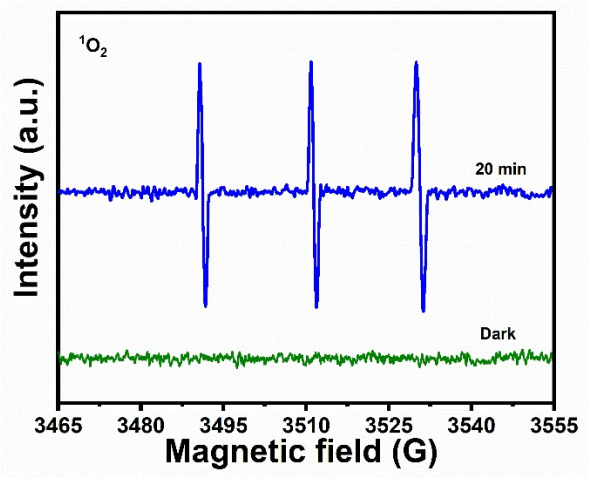

Figure S6. ESR spectra detecting $^1O_2$ in the presence of TEMP.

Table S2. Reported literatures of BB dye and phenol degradation.

Catalyst	Degradation factors	Pollutant	Degradation efficiency (%)	Reaction time (mins)	Reference
WO_3-ZnO	Sonocatalytic degradation Dosage: 2 g/L	BB dye	90	40	[1]
TiO_2	Dosage: 0.5 g/L pH: 6 H_2O_2: 0.2 mmol/L	BB dye	97.7	180	[2]
ZnO	Dosage: 0.35 mg/L pH: 3 Temperature: 35 °C	BB dye	90	15	[3]
Ag-ZnO	Dosage: 0.08 mg/L pH: 12	BB dye	97.14	180	[4]
Bi_2WO_6	Dosage: 0.75 g/L pH: 12 H_2O_2: 0.04 mmol/L	BB dye	>99	300	[5]
NCN/BiWO	Dosage: 1 g/L	Phenol	93.1	240	[6]
g-C_3N_4/CNT/$BiVO_4$	H_2O_2: 5 % vol	Phenol	80.6	120	[7]
2D-CN	Dosage: 0.5 g/L	Phenol	>90	60	[8]
Bi_2O_3/Bi_2MoO_6	Dosage: 0.08 g/L	Phenol	96.4	180	[9]
MgO@Ag_TiO_2	Dosage: 0.2 g/L	Phenol	95	120	[10]

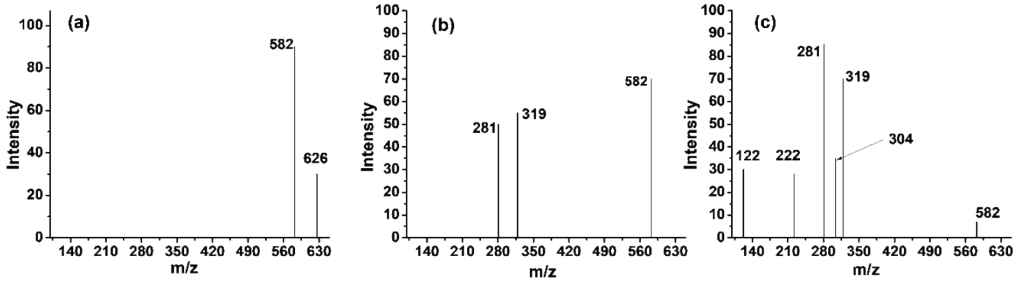

Figure S7. LC-MS spectra of BB dye at (a) 0 min (b) 10 mins (c) 30 mins.

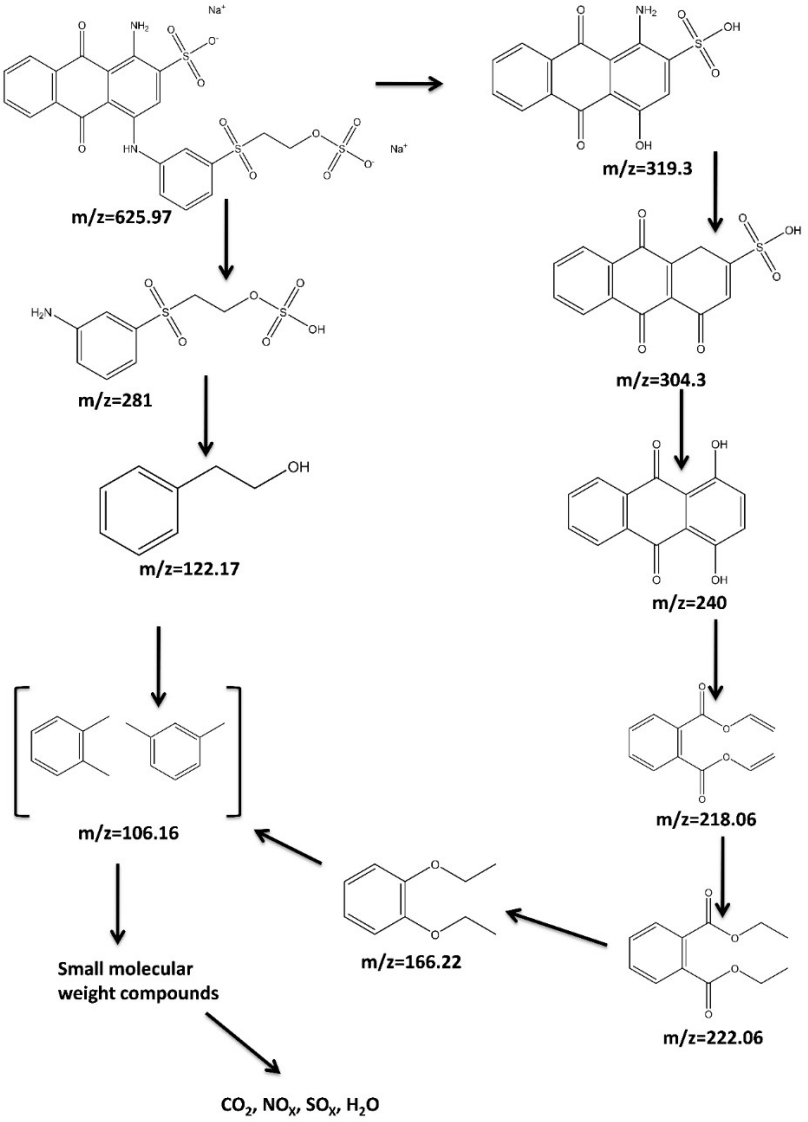

Figure S8. Degradation pathway of BB dye.

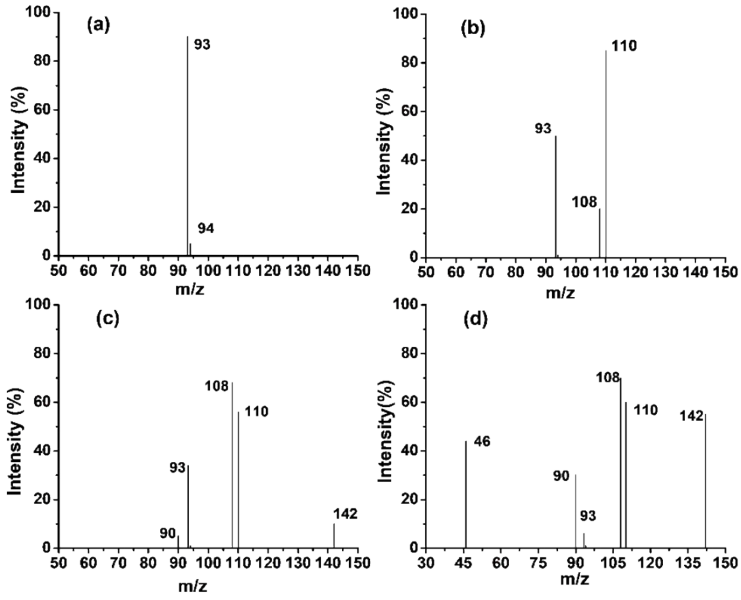

Figure S9. LC-MS spectra of Phenol at (a) 0 min (b) 10 mins (c) 30 mins (d) 80 mins.

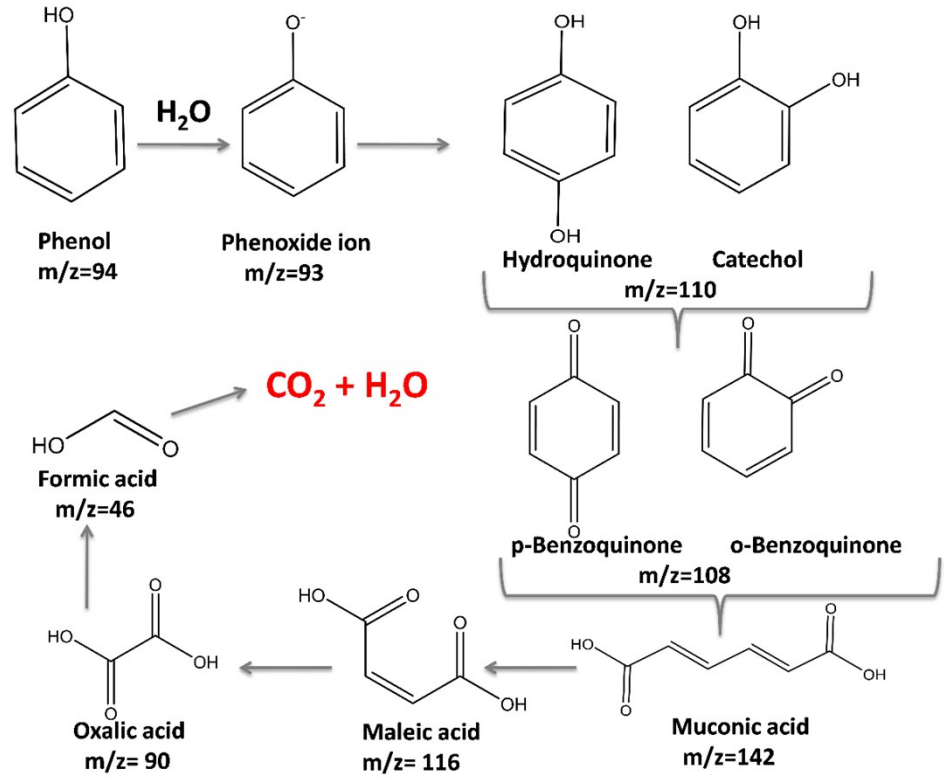

Figure S10. Degradation pathway of Phenol.

References

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