Supporting Information

Chlorobenzene Oxidation over Phosphotungstic Acid Coated Cerium Oxide: Synergistic Effect of Phosphotungstic and Cerium Oxide and Inhibition Mechanism of Sulfur Dioxide

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Comparison of the performance of HPW/CeO_2 for CB oxidation with other reported catalysts

The performance of HPW/CeO_2 for CB oxidation is compared with those of other reported catalysts (Table S2). HPW/CeO_2 exhibited excellent activity for CB oxidation, and its CB conversion at 300 ^oC was approximately 70%, which were higher than those of RuVWTi [1], Mo/VWTi [2], AlVMoTi [3], and Ru/ST [4]. Although the CB conversion of HPW/CeO_2 was slightly lower than those of PMnCe [5], $Cu_{20}CeAl$ [6], $FeVO_4$-Fe_2O_3 [7], and MnO_x-CeO_2 [8], it exhibited higher HCl selectivity at 300 ^oC with approximately 100%. Therefore, HPW/CeO_2 might be a promising catalyst for Cl-VOCs oxidation.

Table S1 Percentages of Ce and W species on/in HPW/CeO_2 /%

	Ce	W	Ce/W
XPS analysis	21	3.8	5.5
XRF analysis	31	2.0	15.5

Table S2 Comparison of the performance of HPW/CeO_2 for CB oxidation with other reported catalysts

Catalyst	Reaction condition	CB conversion at 300 °C	HCl selectivity at 300 °C
PMnCe [5]	100 ppm CB, 60000 $cm^3 g^{-1} h^{-1}$	~80%	~90%
$Cu_{20}CeAl$ [6]	100 ppm CB, 40000 $cm^3 g^{-1} h^{-1}$	~85%	~85%
RuVWTi [1]	100 ppm CB, 40000 $cm^3 g^{-1} h^{-1}$	~68%	~0%
Mo/VTi [2]	100 ppm CB, 30000 $cm^3 g^{-1} h^{-1}$	~45%	~68%
AlVMoTi [3]	100 ppm CB, 120000 $cm^3 g^{-1} h^{-1}$	~25%	~70%
$FeVO_4$-Fe_2O_3 [7]	50 ppm CB, 60000 $cm^3 g^{-1} h^{-1}$	~75%	~75%
Ru/ST [4]	150 ppm CB, 60000 $cm^3 g^{-1} h^{-1}$	~55%	-
MnO_x-CeO_2 [8]	150 ppm CB, 60000 $cm^3 g^{-1} h^{-1}$	~87%	~75%
HPW/CeO_2	100 ppm CB, 60000 $cm^3 g^{-1} h^{-1}$	~70%	~100%

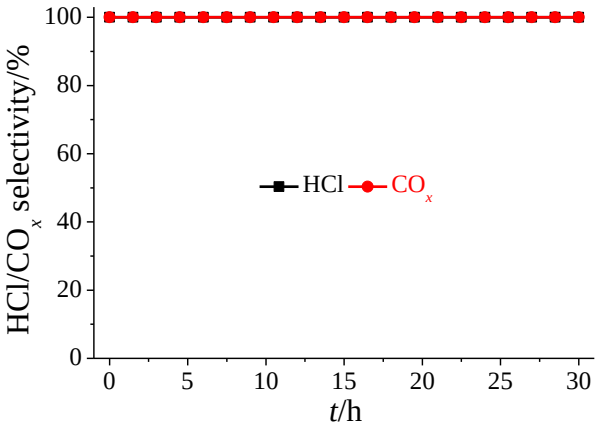

Figure S1. Selectivities of HCl and CO_x during CB oxidation over HPW/CeO_2 at 300 ^oC for 30 h.

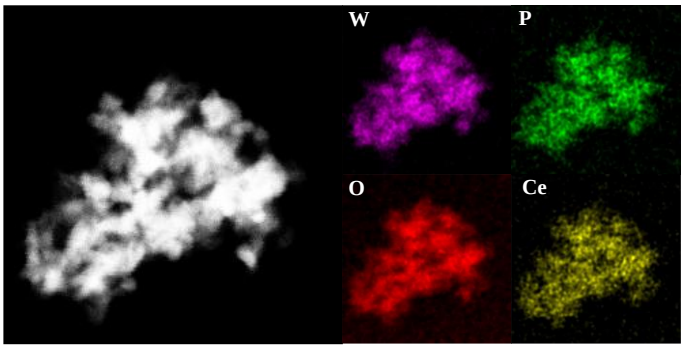

Figure S2. STEM image and corresponding EDS mapping of HPW/CeO_2.

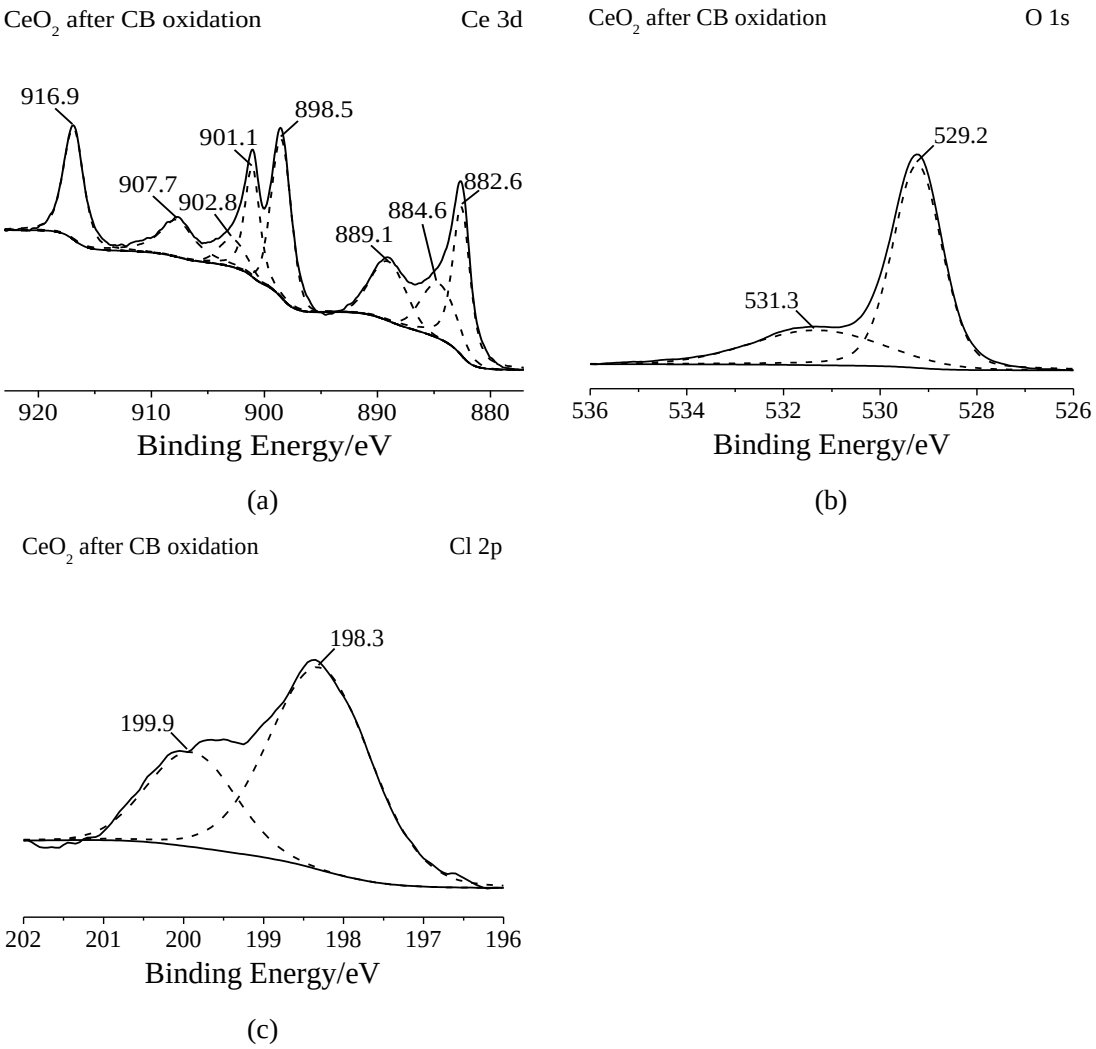

Figure S3. XPS spectra of CeO_2 after CB oxidation in the spectral regions of Ce 3d, O 1s, and Cl 2p.

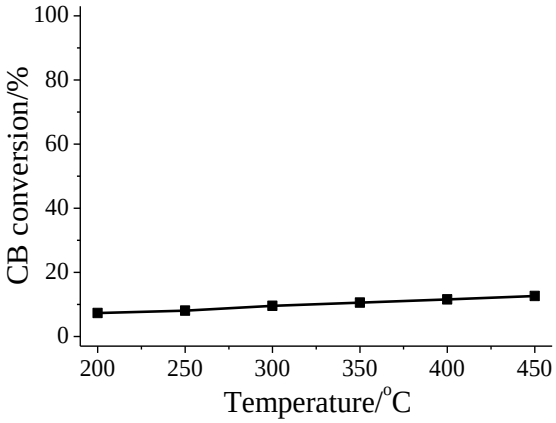

Figure S4. CB conversion efficiency of HPW. Operating conditions: [CB] = 100 ppm, [O_2] = 5%, catalyst mass = 200 mg, total flow rate = 200 mL min^{-1}, and WHSV = 60,000 cm^3 g^{-1} h^{-1}.

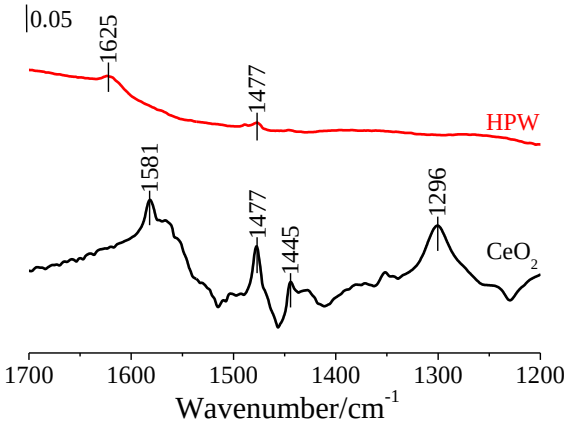

Figure S5 .*In situ* DRIFTS spectra of passing CB over CeO_2 and HPW at 100 ^oC for 30 min.

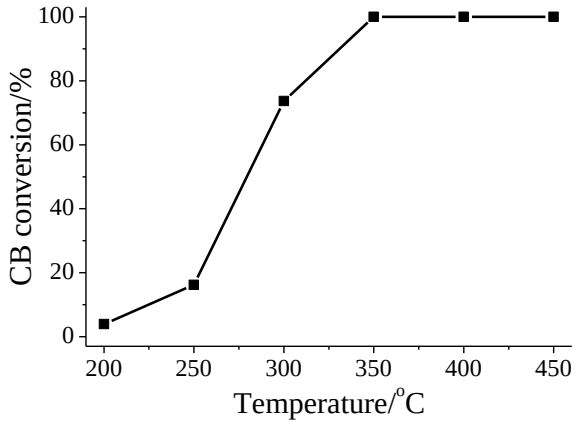

Figure S6. CB conversion efficiency of HPW/CeO_2 under normal flue gas condition at a low WHSV. Operating conditions: [CB] = 100 ppm, [O_2] = 5%, [SO_2] = 100 ppm, [H_2O] = 5%, catalyst mass = 8800 mg, total flow rate = 200 mL min^{-1}, WHSV = 15,000 cm^3 h^{-1} g^{-1}.

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