

Supporting Information

Promotion effect of the Keggin structure on the sulfur and water resistance of Pt/CeTi catalysts for CO oxidation

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Additional figures and Data

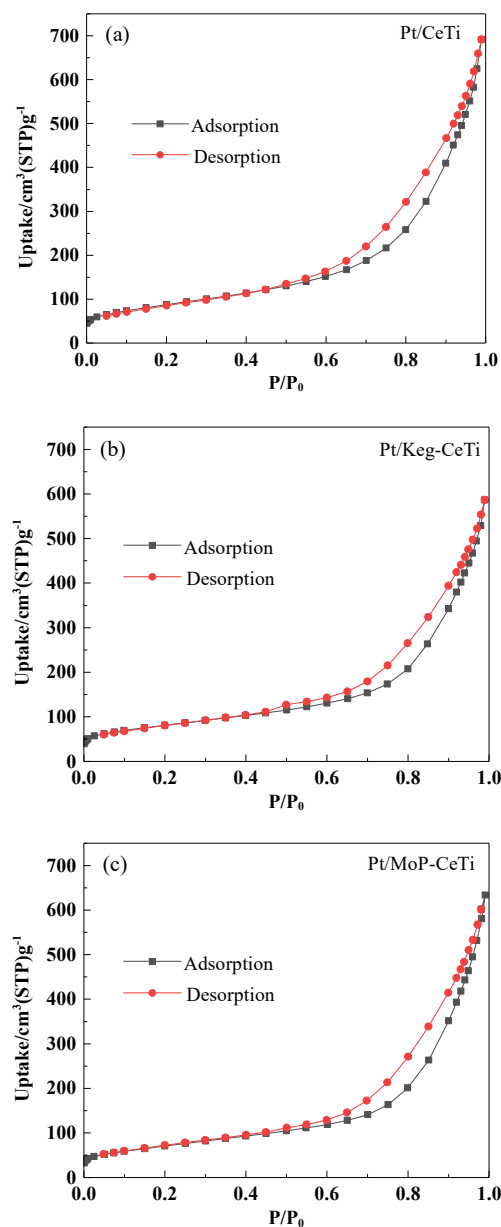


Figure S1 Nitrogen adsorption/desorption isotherms of the Pt/CeTi (a), Pt/Keg-CeTi (b) and Pt/MoP-CeTi (c) catalysts.

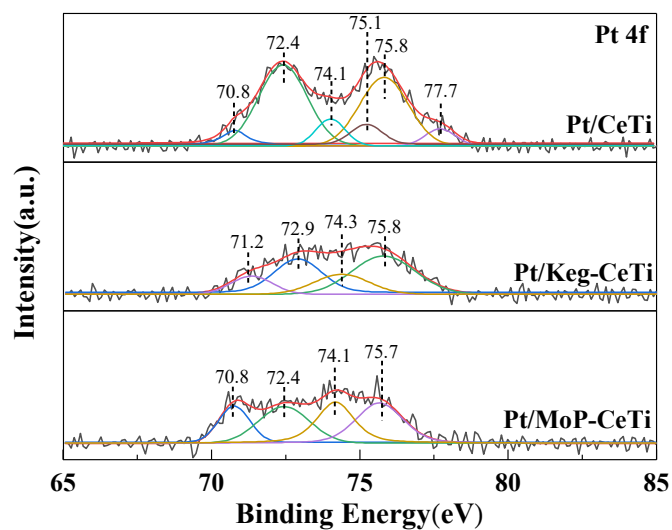


Figure S2 XPS spectra of Pt 4f in the recovered Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi catalysts. The Pt atomic ratios with different valence state were given in the following table:

Sample	Atomic ratio(%)		
	$\text{Pt}^0/(\text{Pt}^0 + \text{Pt}^{2+} + \text{Pt}^{4+})$	$\text{Pt}^{2+}/(\text{Pt}^0 + \text{Pt}^{2+} + \text{Pt}^{4+})$	$\text{Pt}^{4+}/(\text{Pt}^0 + \text{Pt}^{2+} + \text{Pt}^{4+})$
Pt/CeTi	13.9	74.5	11.6
Pt/Keg-CeTi	31.3	68.7	0
Pt/MoP-CeTi	43.4	56.6	0

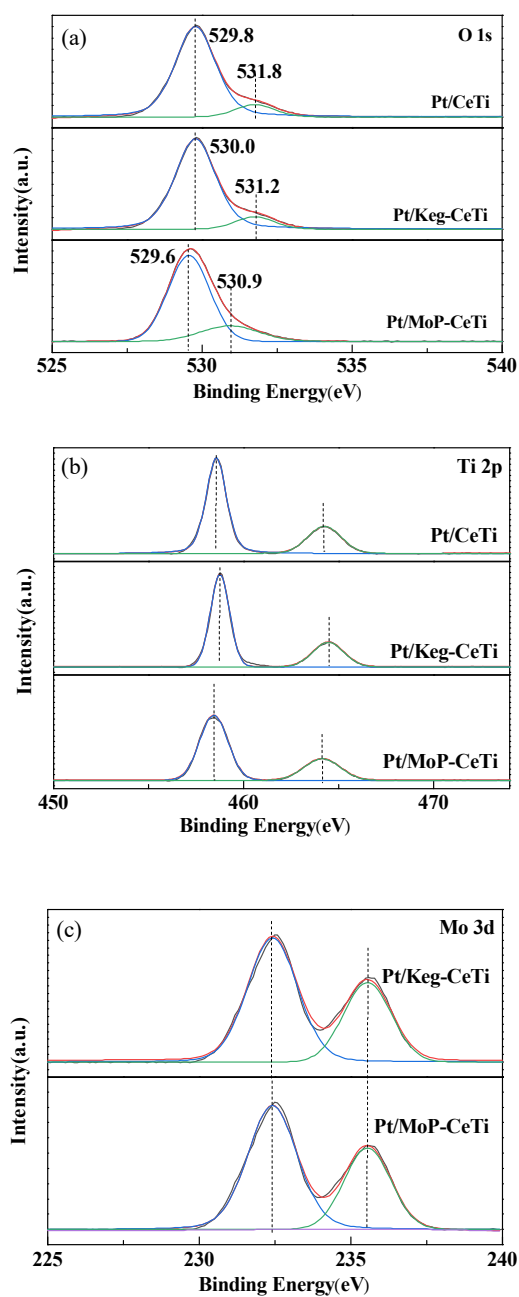


Figure S3 Results of XPS of O 1s (a), Ti 2p (b) and Mo 3d (c) in the Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi catalysts.

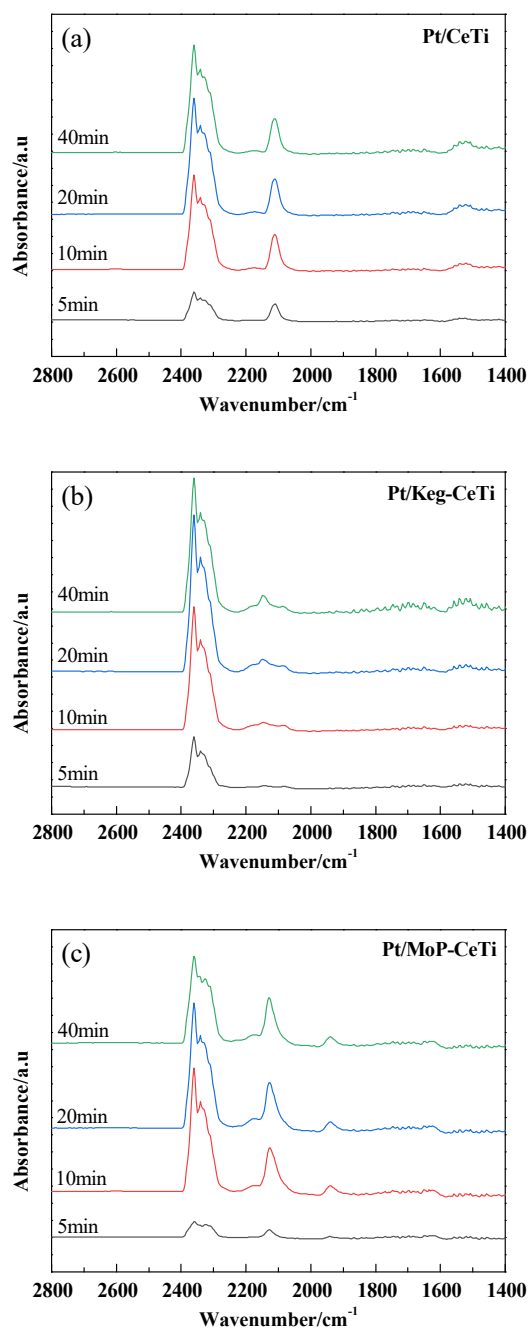


Figure S4 Changes of FTIR spectra of Pt/CeTi (a), Pt/Keg-CeTi (b) and Pt/MoP-CeTi (c) with time under the following conditions: $[\text{CO}] = 2\%$, $[\text{O}_2] = 10 \text{ vol } \%$, balance N_2 , total flow rate = 50 mL/min , $T = 250 \text{ }^\circ\text{C}$.

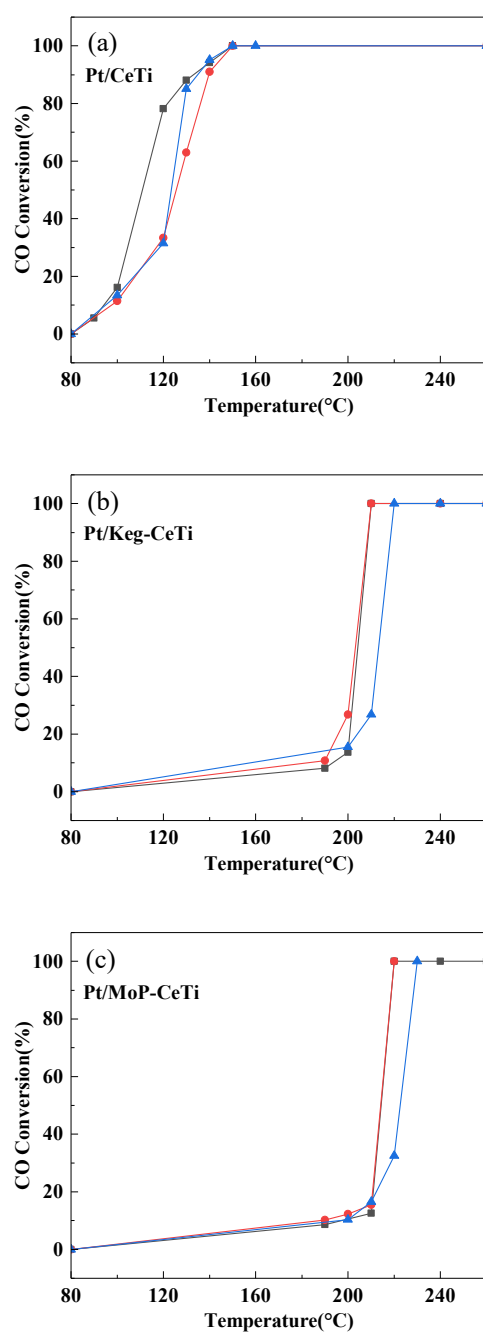


Figure S5 CO conversions as a function of reaction temperature over the three parallel samples of Pt/CeTi (a), Pt/Keg-CeTi (b) and Pt/MoP-CeTi (c), respectively. Reaction conditions: [CO] = 1%, [O₂] = 6 vol %, balance He, total flow rate = 667 ml/min, GHSV = 4 × 10⁵ h⁻¹.

Table S1. ICP results of Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi after poisoned by SO₂ and the poisoned samples treated at 900 °C

Sample	Sulphur content (%)	
	before heat treatment	after heat treatment
Pt/CeTi	0.68	0.07
Pt/Keg-CeTi	0.24	0.05
Pt/MoP-CeTi	0.36	0.04

Table S2. XPS binding energies (eV) of Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi

Sample	Ce 3d _{3/2}		Ce 3d _{5/2}		Pt ⁴⁺ 4f		Pt ²⁺ 4f		O _{ads} 1s		O _{latt} 1s	
	BE	Area *	BE	Area *	BE	Area *	BE	Area *	BE	Area *	BE	Area *
Pt /CeTi	900.1	12.3	881.6	22.2	74.8	14.8	73.0	37.1	531.8	10.1	529.8	89.9
	902.7	8.1	884.4	9.9								
	906.4	9.8	887.5	13.1	78.3	8.5	76.4	39.5				
	916.0	11.0	897.6	13.6								
	Pt/Keg -CeTi	900.8	10.3	882.2	14.5	74.7	14.7	73.1	35.2	531.2	22.2	530.0
903.1		11.0	884.4	20.0								
907.5		6.5	888.9	10.9	77.8	10.0	76.3	40.1				
916.6		11.6	898.2	15.1								
Pt /MoP -CeTi		900.1	13.8	881.6	19.4	74.4	37.7	72.2	11.0	530.9	20.1	529.6
	903.4	15.1	885.3	27.2								
	906.5	6.6	888.7	4.8	78.0	18.1	76.3	33.2				
	916.0	6.2	897.6	6.8								

* The area is percentage content (%)

Table S3. Relative area of NH₃-TPD desorption peak of Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi

Sample	area of low temperature region (<200 °C)	area of high temperature region (>200 °C)	Total
Pt/CeTi	775.6	1631.0	2406.6
Pt/Keg-CeTi	980.4	3042.2	4022.6
Pt/MoP-CeTi	716.9	824.8	1541.7

Table S4. H₂ consumption of Pt/CeTi, Pt/Keg-CeTi and Pt/MoP-CeTi calculated from the H₂-TPR curves

Sample	H ₂ consumption (μmol/g)			Total
	<100 °C	100–550 °C	550–800 °C	
Pt/CeTi	4.0	83.4	97.7	185.1
Pt/Keg-CeTi	34.5	60.3	55.4	150.2
Pt/MoP-CeTi	41.6	77.2	40.8	159.6