Energy Materials

Supporting Material (SM)

Flame made low Pt loading catalysts supported on different metal oxides for catalytic combustion of CO and CH_4

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Table S1. Formulation and process parameters of catalyst preparation by FSP

Sample	Solvent	Support precursor (0.3 mol/L)	Atomic ratio of Pt to support (mol%)	Process parameters
0.025Pt/TiO_2	Ethanol	Titanium n-butoxide	0.025	Solution feeding: 3
0.05Pt/TiO_2			0.05	mL/min;
0.1Pt/TiO_2			0.1	Atomizing gas: 5 L/min O_2
0.5Pt/TiO_2			0.5	with pressure drop of 1.5
0.025Pt/ZrO_2		Zirconium n-propanol	0.025	bar;
0.05Pt/ZrO_2			0.05	Pilot flame: 0.75 L/min
0.1Pt/ZrO_2			0.1	CH_4, 1.5 L/min O_2;
0.5Pt/ZrO_2			0.5	Sheath gas: 8 L/min Ar.
0.025Pt/MgO		Magnesium acetate	0.025	
0.05Pt/MgO			0.05	
0.1Pt/MgO			0.1	
0.5Pt/MgO			0.5	
0.025Pt/ZnO	Xylene	Zinc naphthenate	0.025	
0.05Pt/ZnO			0.05	
0.1Pt/ZnO			0.1	
0.5Pt/ZnO			0.5	

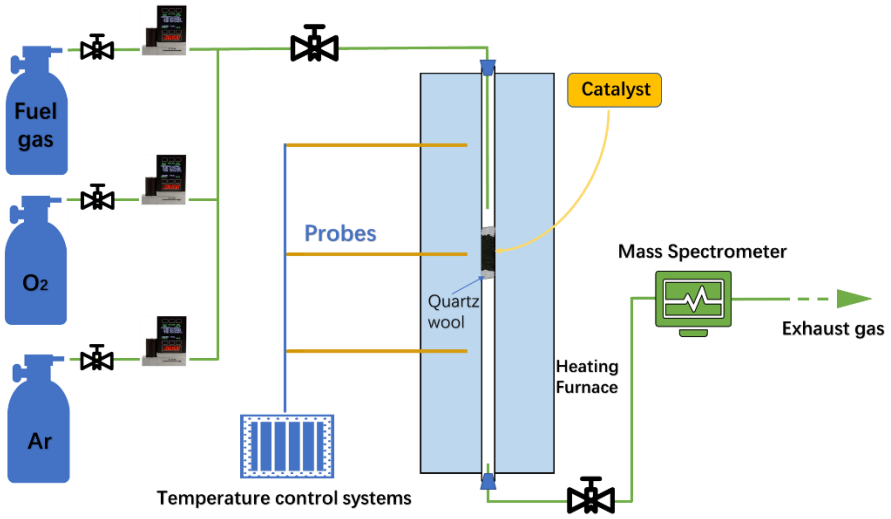

Fig. S1. Schematic diagram of the activity test for CO or CH_4 catalytic combustion

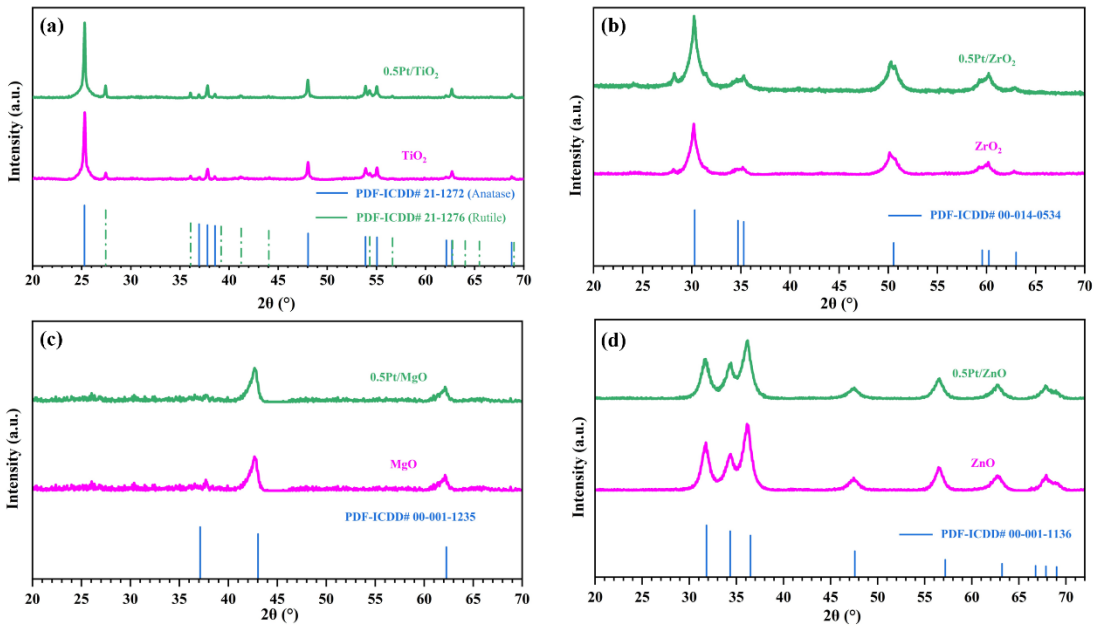

Fig. S2. XRD patterns of the samples: (a) Pt/TiO_2, (b) Pt/ZrO_2, (c) Pt/MgO, (d) Pt/ZnO. The data of anatase (101) crystal face (2θ=25.3°, [PDF-ICDD 21-1272]) and (110) crystal face of rutile (2θ=27.4°, [PDF-ICDD 21-1276]) are used. The content of anatase and rutile in the sample is calculated according to the formula [1]:

$$W_{\text{Rutile}} = (1 + 0.8 \times I_A / I_R)^{-1}$$

where W_{Rutile} is the content of the rutile phase, and I_A and I_R are the main peak intensities of the anatase and rutile phase diffraction peaks, respectively.

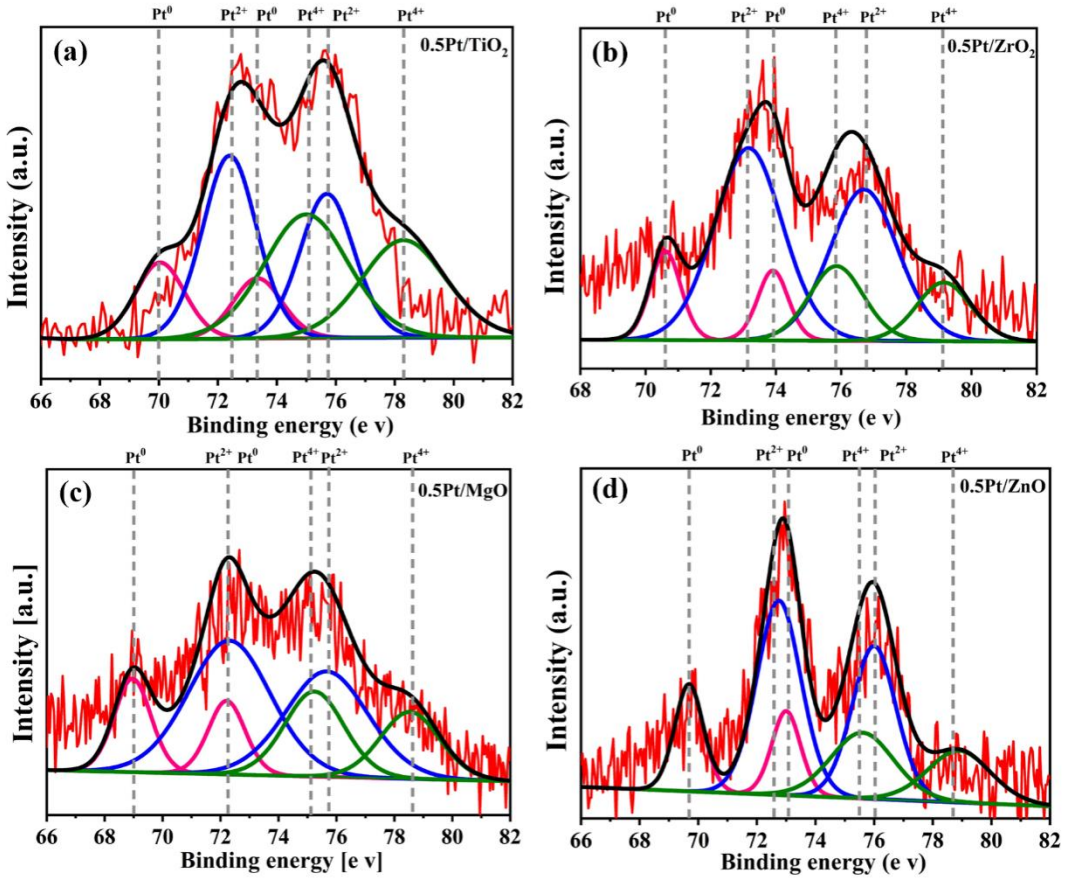

Fig. S3. Pt 4f XPS spectra of the samples: (a) 0.5Pt/TiO_2, (b) 0.5Pt/ZrO_2, (c) 0.5Pt/MgO, (d) 0.5Pt/ZnO.

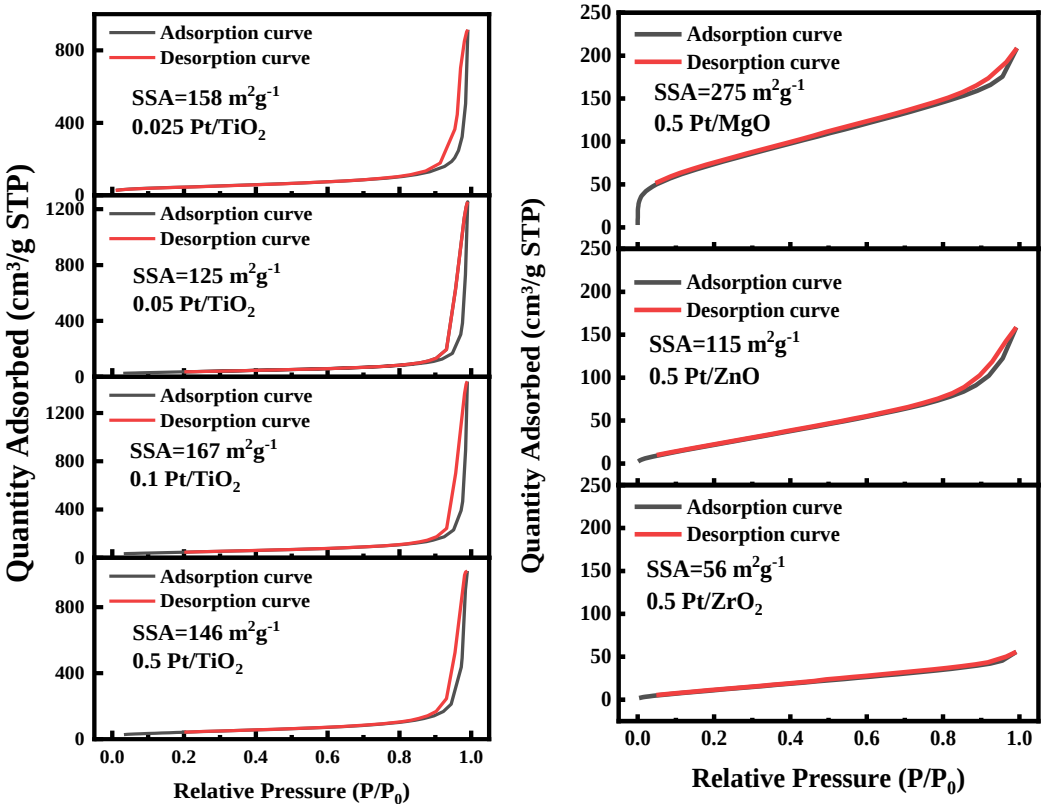

Fig. S4 Nitrogen adsorption and desorption isotherms of (a) Pt/TiO_2 catalyst with different Pt contents, (b) $0.5Pt/ZrO_2$, 0.5Pt/MgO, 0.5Pt/ZnO catalyst.

References

[1] Chaisuk C, Wehatoranawee A, Preampiyawat S, Netiphat S, Shotipruk A, Mekasuwandumrong O. Preparation and characterization of CeO_2/TiO_2 nanoparticles by flame spray pyrolysis, *Ceram Int* 2011;37(5):1459-1463. [DOI:10.1016/j.ceramint.2010.11.018]