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高分散还原态 Pt 基催化剂的制备及其 NO 氧化的催化性能

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Preparation of Reduced Pt-Based Catalysts with High Dispersion and Their Catalytic Performances for NO Oxidation

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1 The reaction rate and TOF calculation

The reaction rate (r) and TOF of NO oxidation were calculated by the following equation [1]:

$$r = \frac{FX}{\upsilon W} \quad (1)$$

where F is the inlet NO molar flow rate, X denotes the fractional conversion of NO at a particular temperature (< 10%), υ is the stoichiometric coefficient of NO, and W is the weight of the catalyst.

$$\mathrm{TOF} = \frac{rM_{\mathrm{Pt}}}{DX_{\mathrm{M}}} \quad (2)$$

where M_{Pt} is the molar weight of metal Pt (195.08 g·mol^{-1}), X_{M} denotes the Pt weight percent tested by ICP-OES, and D represents Pt dispersion obtained from TEM.

2 Supporting Figures

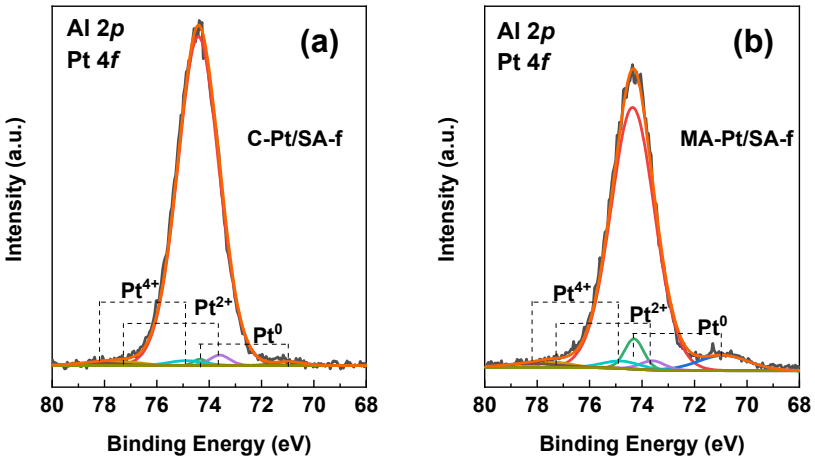

Fig. S1 XPS spectra of Al 2*p* and Pt 4*f* for C-Pt/SA-f (a) and MA-Pt/SA-f (b) samples.

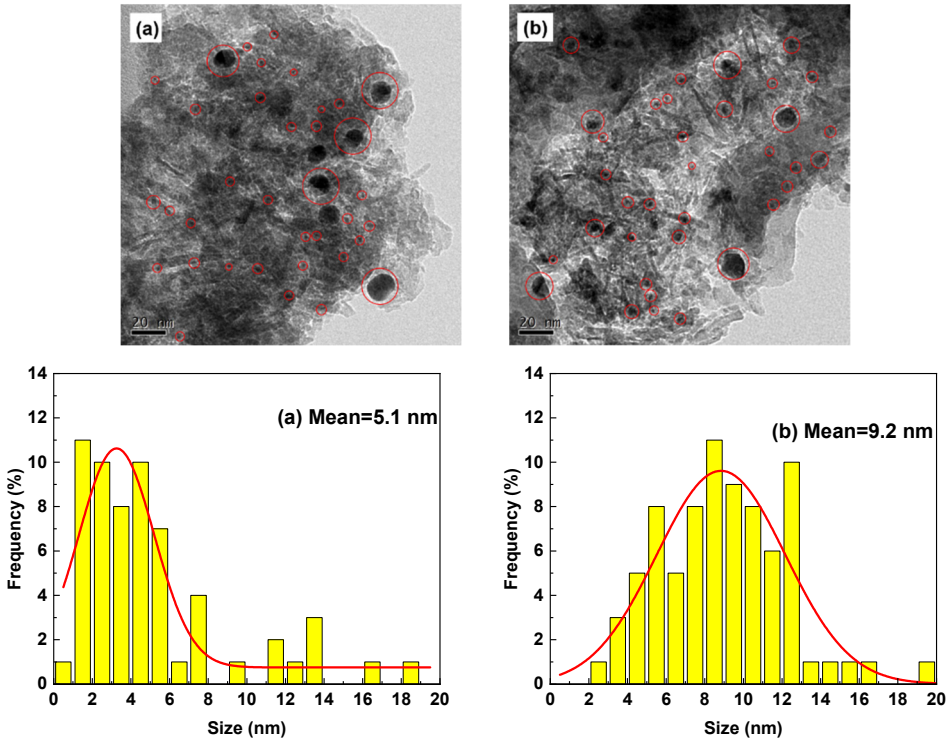

Fig. S2 TEM images and size distribution of Pt nanoparticles over MA-Pt/SA-a (a) and C-Pt/SA-a (b) catalyst.

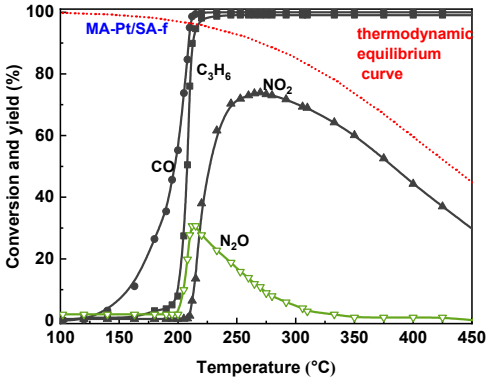

Fig. S3 The CO, C_3H_6 conversion and NO_2, N_2O yields for MA-Pt/SA-f under simulative exhaust gases (0.1% CO, 0.033% C_3H_6, 0.02% NO, 8% CO_2, 10% O_2, N_2 balance, GHSV 60000 h^{-1}).

Taking MA-Pt/SA-f for example, the NO conversion of MA-Pt/SA-f didn't correspond to thermodynamic equilibrium curve due to the influence of CO and C_3H_6. Giroir-Fendler *et al*. also reported similar phenomenon [2].

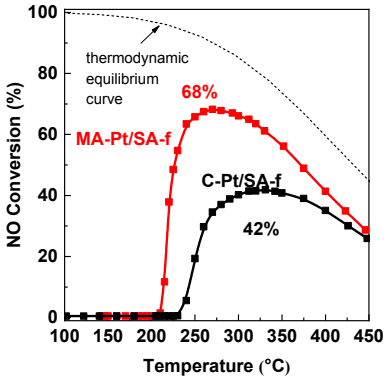

Fig. S4 NO conversion of MA-Pt/SA-f and C-Pt/SA-f in presence of 7% H_2O.

Reaction condition: 0.1% CO, 0.033% C_3H_6, 0.02% NO, 10% O_2, 8% CO, 7% H_2O, N_2 balance, GHSV 60000 h^{-1}.

3 Supporting Tables

Table S1 H_2-TPR data of all catalysts.

Sample	The peak temperature (°C)	Total area
C-Pt/SA-f	136	2684
MA-Pt/SA-f	123	1691
C-Pt/SA-a	146	2884
MA-Pt/SA-a	130	1868

Table S2 Comparison of catalytic performance for NO oxidation over different Pt-based catalysts.

Fresh catalysts	Pt loading	Preparation method	Maximum NO conversion	Ref.
MA-Pt/SA	~1% (*w*, mass fraction)	modified alcohol reduction-impregnation method	74%	This work
HCP-500	~2% (*w*)	incipient wetness impregnation	~30%	3
PAA-500	~2% (*w*)	incipient wetness impregnation	~50%	3
FSP-500	~2% (*w*)	flame spray pyrolysis	~60%	3
SC-500	~2% (*w*)	sc-CO_2 deposition	~58%	3
LA-500	~2% (*w*)	pulsed laser ablation in liquid	~82%	3
SA1	~1% (*w*)	impregnation	~58%	4

Table S3 The activity results of CO, C_3H_6 and NO oxidation over MA-0.5Pt/SA-f and C-Pt/SA-f.

Catalysts	CO		C_3H_6		NO
	T_{50}/°C	T_{90}/°C	T_{50}/°C	T_{90}/°C	Maximum conversion/%
MA-0.5Pt/SA-f	210	220	219	224	64
C-Pt/SA-f	221	236	229	237	51

References

(1) Yang, Z. Z.; Zhang, N.; Gong, M. C.; Zhao, M.; Chen, Y. Q. *Catal. Sci. Technol.* **2014,** *4*, 3032. doi: 10.1039/C4CY00424H

(2) Giroir-Fendler, A.; Gil, S.; Baylet, A. *Chin. J. Catal.* **2014,** *35*, 1299. doi: 10.1016/S1872-2067(14)60173-X

(3) Ogel, E.; Casapu, M.; Doronkin, D. E.; Popescu, R.; Störmer, H.; Mechler, C.; Marzun, G.; Barcikowski, S.; Türk, M.; Grunwaldt, J. D. *J. Phys. Chem. C* **2019,** *123*, 5433. doi: 10.1021/acs.jpcc.8b11065

(4) Hansen, T. K.; Høj, M.; Hansen, B. B.; Janssens, T. V. W.; Jensen, A. D. *Top Catal.* **2017,** *60*, 1333. doi: 10.1007/s11244-017-0818-9