

ELECTRONIC SUPPORTING INFORMATION (ESI)

**AgPd nanoparticles supported on zeolitic imidazolate framework derived N-
doped nanoporous carbon as efficient catalysts for formic acid
dehydrogenation**

Cheng Feng, Yunhui Hao, Li Zhang, Ningzhao Shang, Shutao Gao, Zhi Wang and
Chun Wang**

College of Science, Agricultural University of Hebei, Baoding 071001, China

Calculation methods:

The turnover frequency (TOF) reported here is an apparent TOF value based on the number of Pd and Ag atoms in catalyst, which is calculated from the equation as follows:

$$TOF = \frac{P_{atm} V_{gas} / RT}{2n_{metal}t} \quad (S1)$$

where TOF is initial turnover frequency, P_{atm} is atmospheric pressure (101325 Pa), V_{gas} is the final generated volume of H_2/CO_2 gas, R is the universal gas constant ($8.3145 \text{ m}^3 \cdot \text{Pa} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$), T is the room temperature (298 K), n_{metal} is the mole number of the metallic catalyst and t is the reaction time of 5 min.

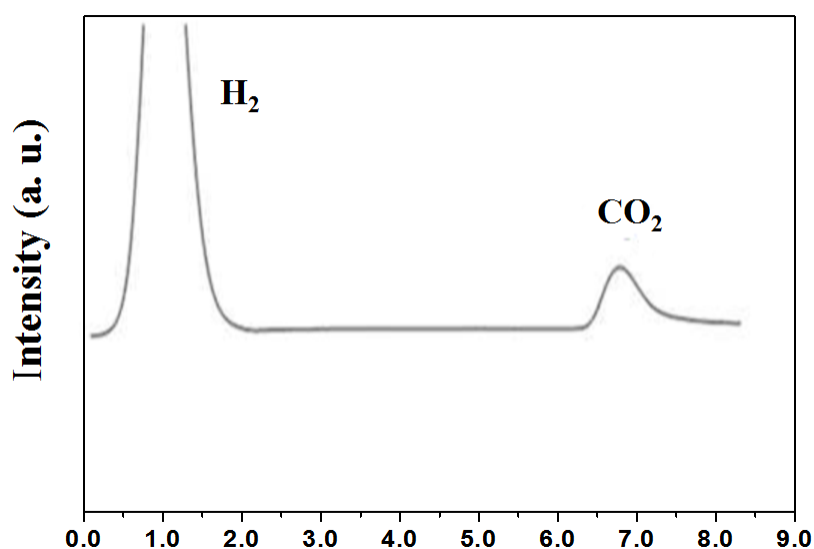


Fig. S1 GC spectrum using TCD for the evolved gas from FA aqueous solution (1.25 M, 1.0 mL) over $Ag_1Pd_4@ZIF8-C(1173)$ composite at 353 K ($n_{metal}/n_{FA} = 0.01$).

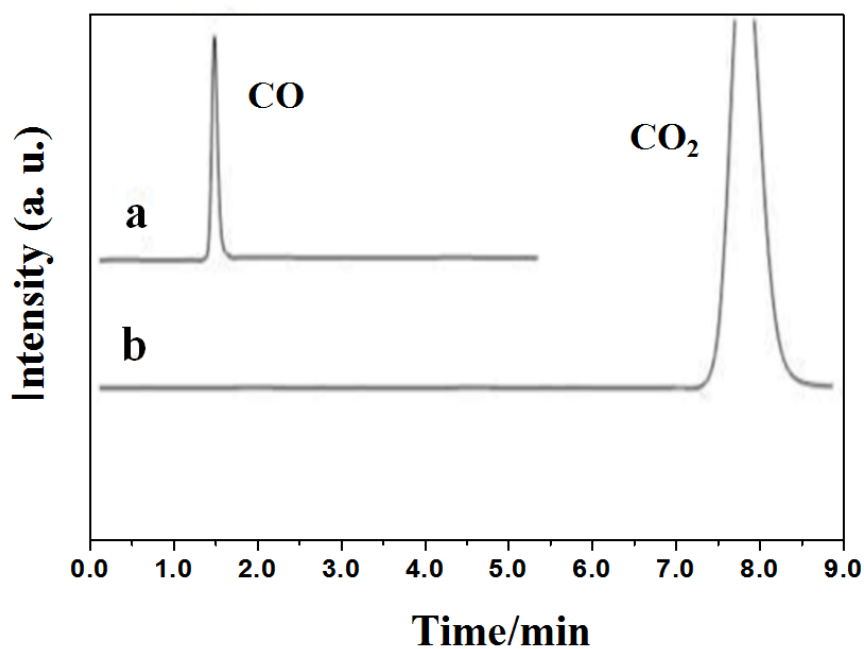


Fig. S2 GC spectrum using FID-Methanator for the (a) commercial pure CO, and (b) evolved gas from FA aqueous solution (1.25 M, 1.0 mL) over $\text{Ag}_1\text{Pd}_4@\text{ZIF8-C}(1173)$ composite at 353 K ($n_{\text{metal}}/n_{\text{FA}} = 0.01$).

Table S1 The metal mass content in the catalysts.

Catalysts	Pd mass content (%)	Ag mass content (%)
$\text{Pd}_5@\text{ZIF8-C}(1173)$	4.81	0.00
$\text{Ag}_1\text{Pd}_4@\text{ZIF8-C}(1173)$	0.85	4.11
$\text{Ag}_2\text{Pd}_3@\text{ZIF8-C}(1173)$	1.79	3.22
$\text{Ag}_5@\text{ZIF8-C}(1173)$	0.00	4.95
$\text{Ag}_1\text{Pd}_4@\text{ZIF8-C}(1073)\text{-HCl}$	1.02	4.04
$\text{Ag}_1\text{Pd}_4@\text{ZIF8-C}(1073)$	1.10	4.20
$\text{Ag}_1\text{Pd}_4@\text{ZIF8-C}(1273)$	0.77	3.91

Table S2 The recyclability Ag₁Pd₄@ZIF8-C(1173) for decomposition of FA^a.

Run	TOF ^b (h ⁻¹)	V _{gas} ^c (mL)
1	936	56.5
2	933	56.3
3	928	56.0
4	916	55.3
5	900	54.3

^a. Reaction condition: FA aqueous solution (1.25 M, 1.0 mL) over Ag₁Pd₄@ZIF8-C(1173) at 353

K (n_{metal}/n_{FA} = 0.01);

^b. TOF were calculated during the first 5 min of the reactions;

^c. V_{gas} were the volume of H₂ /CO₂ gas calculated during the first 5 min of the reactions.