Supporting Information

for

Ultrafine Pd Particles Embedded in Nitrogen-enriched Mesoporous Carbon for Efficient H_2 Production from Formic Acid Decomposition

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(Summary of Content: 9 pages, 4 tables and 3 figures)

Table S1. Surface areas, pore volumes and mesopore diameters of supports

Sample	S_{BET} m^2/g	Volume cm^3/g	Average pore diameter nm
NMC-400	36.0	0.03	3.4
NMC-500	292.8	0.28	3.8
NMC-600	384.3	0.42	4.3
NMC-700	435.9	0.47	4.4
NMC-800	412.8	0.49	4.7
MC-600	987.6	1.04	4.2
SBA-15	532.1	0.88	6.4

Table S2. Surface areas, pore volumes and mesopore diameters of supported Pd catalysts

Sample	S_{BET} m^2/g	Volume cm^3/g	Average pore diameter nm
Pd/NMC-400	22.6	0.02	3.8
Pd/NMC-500	269.6	0.30	4.0
Pd/NMC-600	321.6	0.34	4.3
Pd/NMC-700	431.6	0.48	4.4
Pd/NMC-800	397.4	0.47	4.9
Pd/MC-600	923.5	0.96	4.2

Table S3. The ratio of each N species to total surface N in Pd/NMC-X.

Catalysts	Pyridinic N (%) 398.5 eV	Amine N (%) 399.2 eV	Pyrrole N (%) 400.2 eV	Graphitic N (%) 401.0 eV	Pyridinic oxide (%) 403.0 eV
Pd/NMC-400	47.3	11.3	27.2	14.2	0
Pd/NMC-500	44.1	10.3	25.6	19.9	0
Pd/NMC-600	44.0	7.5	20.9	24.1	3.5
Pd/NMC-700	34.3	6.7	23.3	28.7	7.1
Pd/NMC-800	27.7	2.8	22.7	36.2	10.6

Table S4. Comparison of TOF value of this work with previous reported ones.

Catalysts	Temperature (^{o}C)	Additive	TOF (h^{-1})	Ref.
Pd/mpg-C_3N_4	25	no	144	[1]
AgPd/C	25	no	158	[2]
CoAuPd/C	25	no	49	[3]
Pd/CN + hv	25	no	64	[4]
PdAu/C	25	no	66	[5]
SBA-15-Amine/Pd	25	no	293	[6]
Pd_{SI}/CNF	30	no	979	[7]
Pd-Mn_x/SiO_2-NH_2	50	no	1300	[8]
Pd/NMC-400	25	no	913	This work

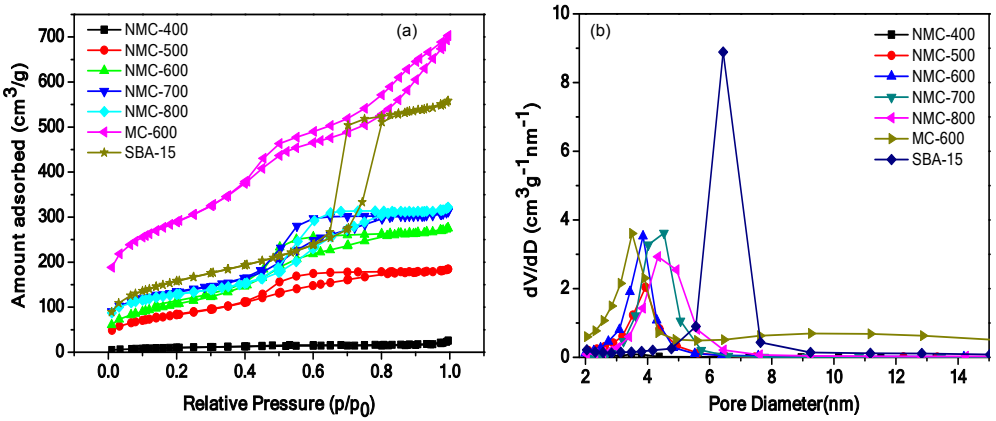

Figure S1. (a) Nitrogen adsorption-desorption isotherms and (b) the pore-size distributions of NMC and MC samples.

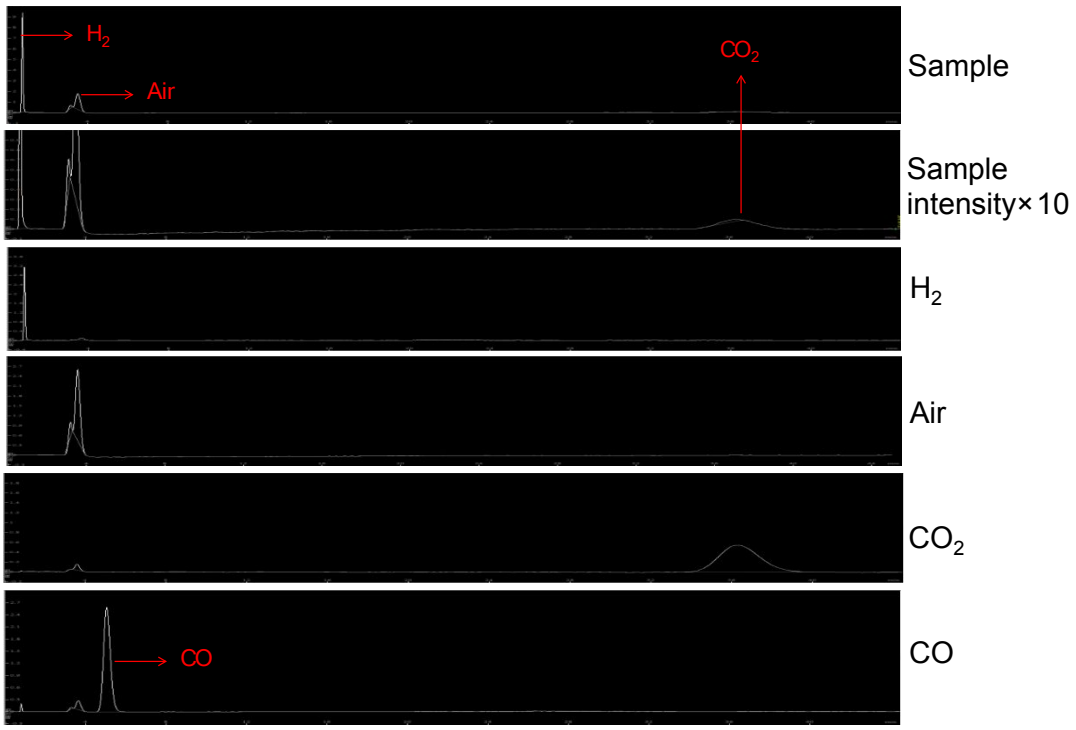

Figure S2. Analysis result of the product composition for the catalytic formic acid decomposition on Pd/NMC-600 recorded on a GC-TCD with TDX-1 packed column.

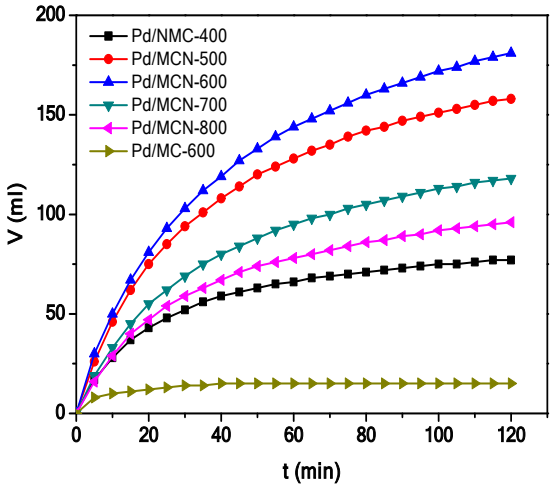

Figure S3. Total gas generation profiles of FA decomposition catalyzed by supported Pd catalysts in 120 min reaction time. Reaction conditions: 10 ml of 1 M FA, Catalyst dosage: 30 mg, reaction temperature: 25 ^{o}C.

Reference

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