Electronic Supplymentary Information

(ESI)

g-C_3N_4 supported metal (Pd, Ag, Pt) catalysts for hydrogen-production from formic acid

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S I. Raman spectra

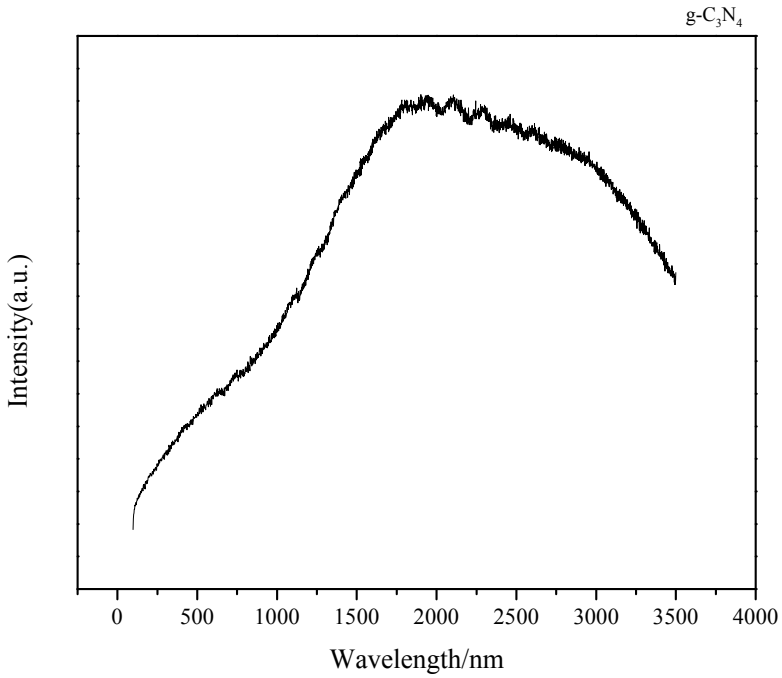

Figure S1. Raman spectrum of g-C_3N_4 (532nm laser source)

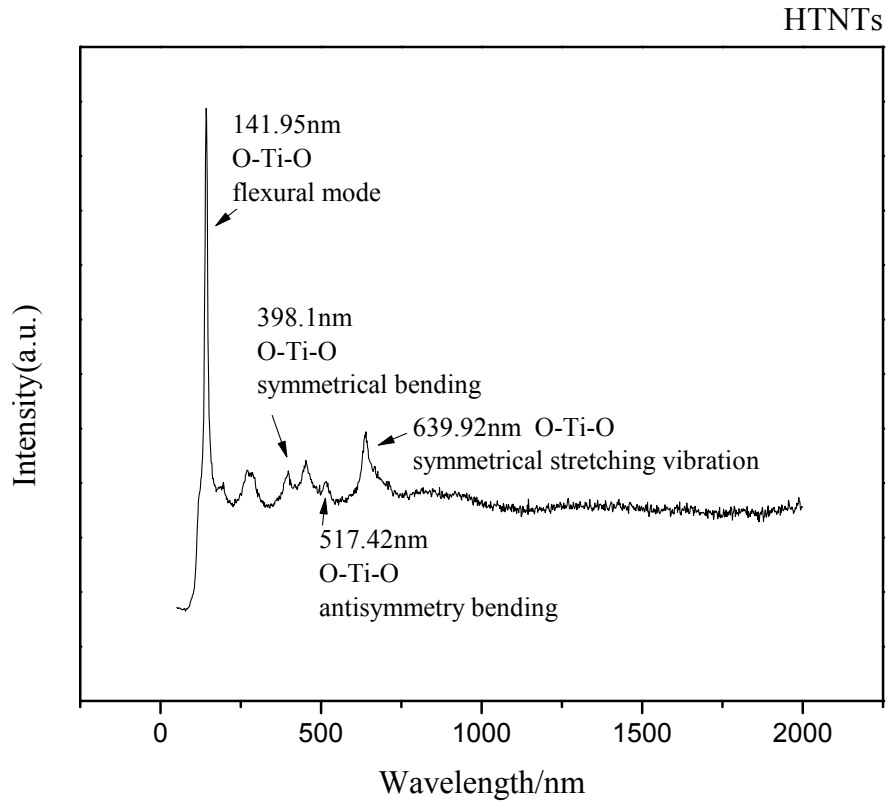

Figure S2. Raman spectrum of HTNTs (532nm laser source)

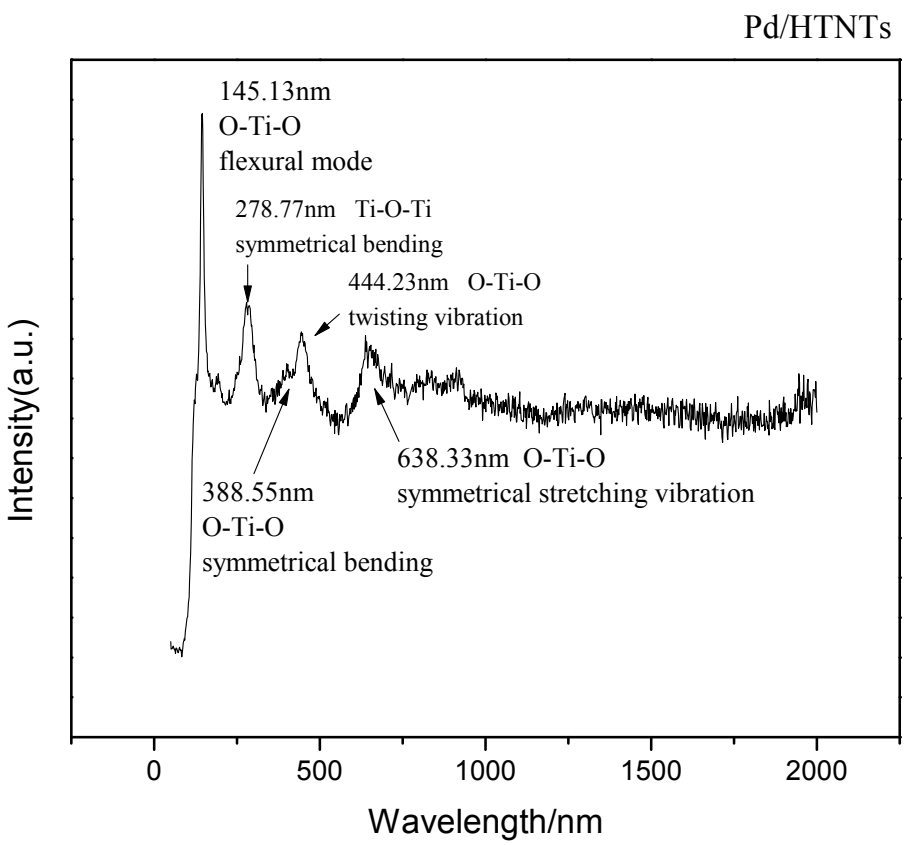

Figure S3. Raman spectrum of Pd/HTNTs (532nm laser source)

S II. Metal content

Table S1. Metal contents of catalysts after catalytic reaction.

Sample	Contents (%)		
	Pd	Pt	Ag
Pd/g-C_3N_4	1.08	—	—
Pt/g-C_3N_4	—	0.66	—
Pt-Pd/g-C_3N_4	1.03	0.51	—
Ag/g-C_3N_4	—	—	0.39
Ag-Pd/g-C_3N_4	1.01	—	0.59
Pd/HTNTs	0.93	—	—
Pt-Pd /HTNTs	0.91	1.28	—
Ag-Pd /HTNTs	0.97	—	0.59

S III. XPS spectra

The Pd 3d spectra exhibits two contributions. Major part is Pd^0, located at 334.4-335.35 eV ($3d_{5/2}$) and 339.6-340.6 eV ($3d_{3/2}$), which can be assigned to be Pd NPs. And minor part is Pd^{2+}, located at 336.35-338.15 eV ($3d_{5/2}$) [1, 2] and 341.75-343.30 eV ($3d_{3/2}$)[3], which has no catalytic activity.

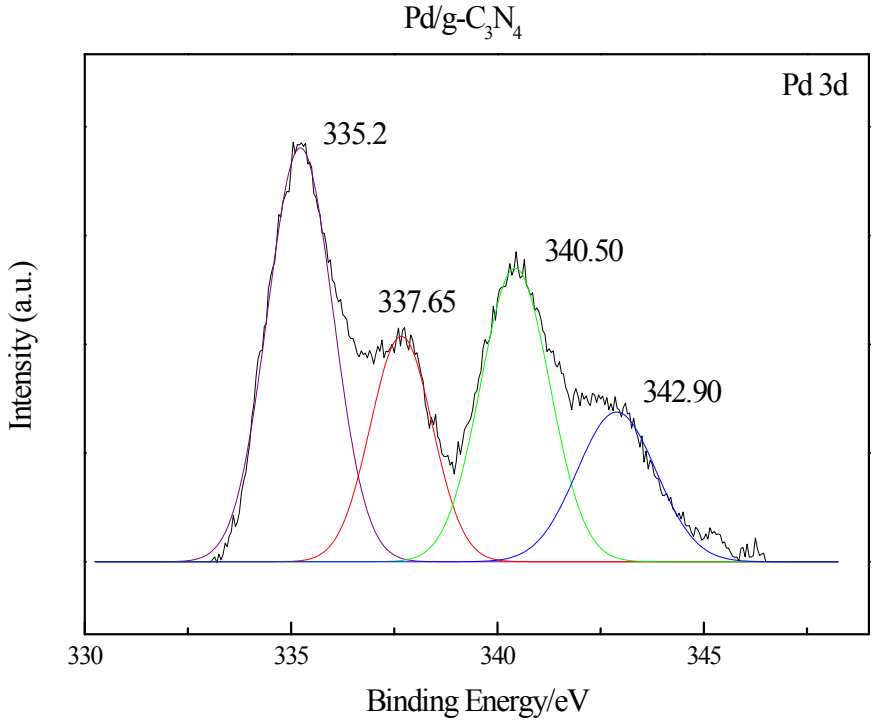

Figure S4. XPS spectrum of Pd 3d peaks of Pd/g-C_3N_4

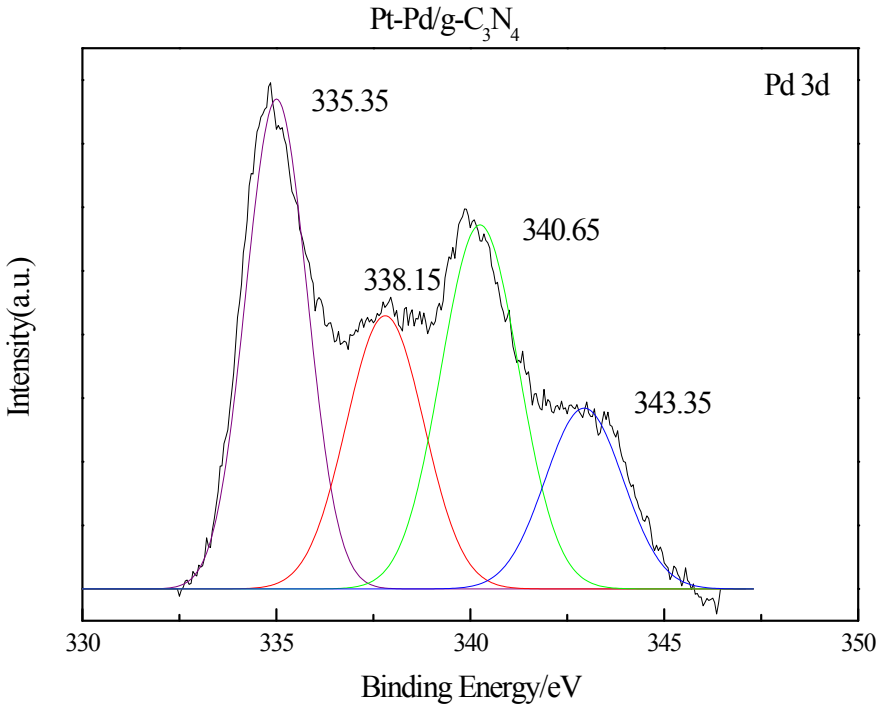

Figure S5. XPS spectrum of Pd 3d peaks of Pt-Pd/g-C_3N_4

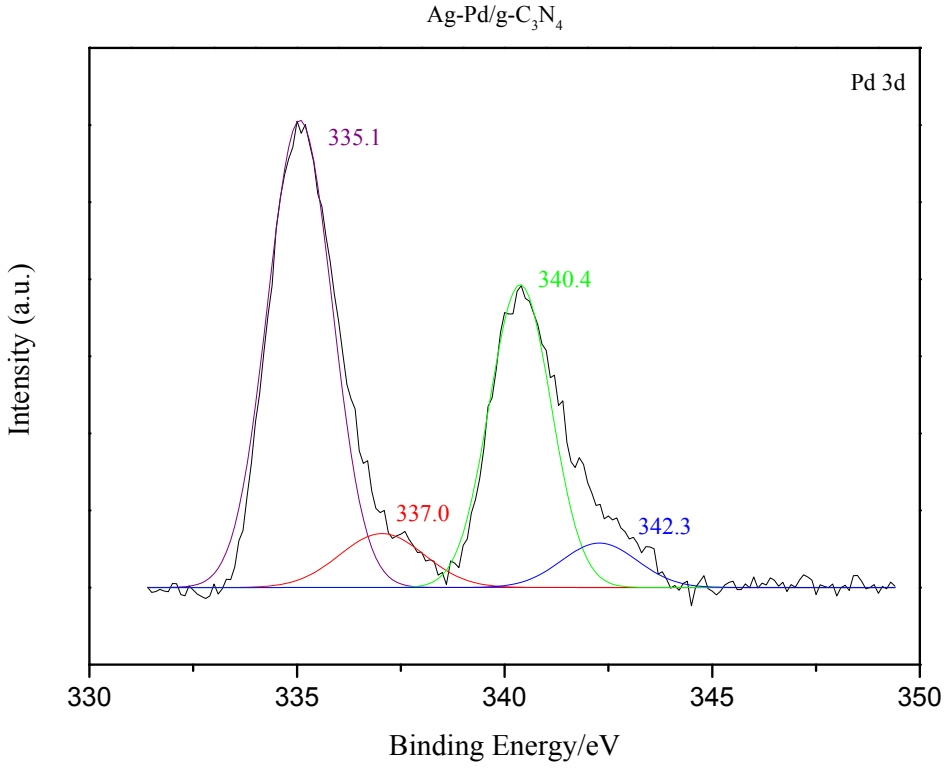

Figure S6. XPS spectrum of Pd 3d peaks of Ag-Pd/g-C_3N_4

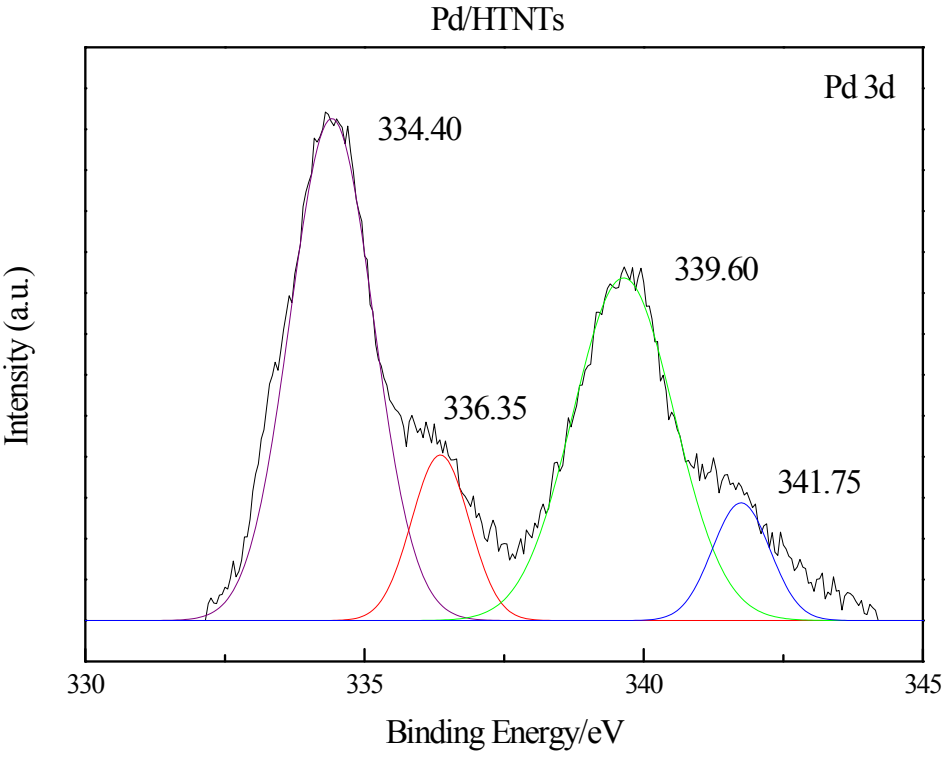

Figure S7. XPS spectrum of Pd 3d peaks of Pd/HTNTs

S IV. TEM images

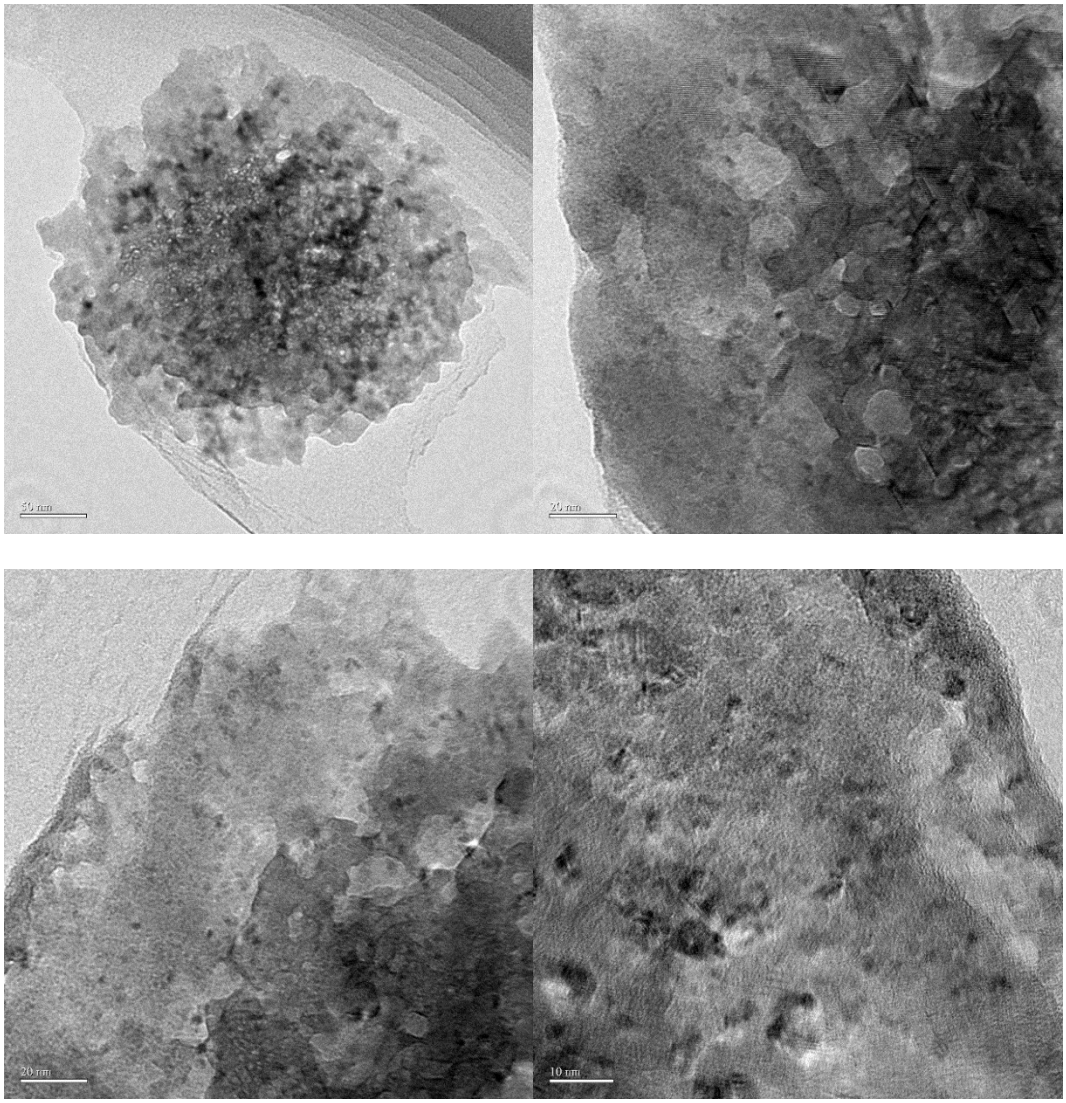

Figure S8. TEM images of Pd/g-C_3N_4

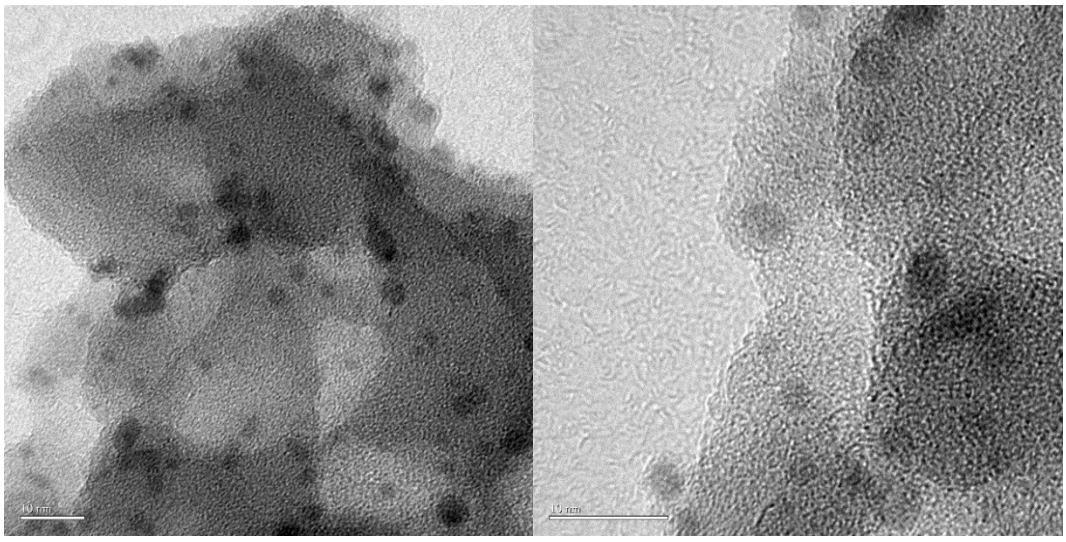

Figure S9. TEM images of Pt-Pd/g-C_3N_4

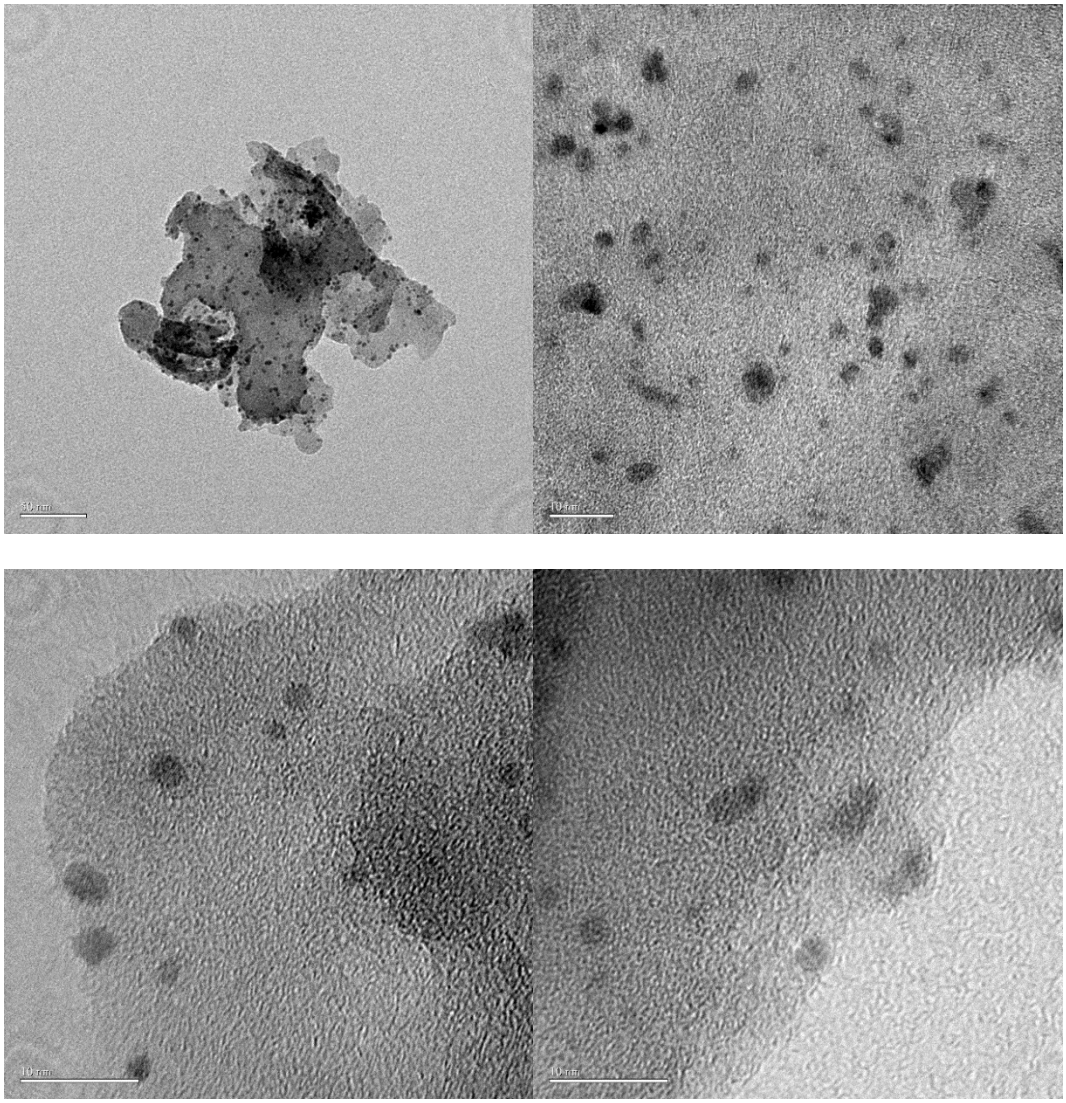

Figure S10. TEM images of Ag-Pd/g-C_3N_4

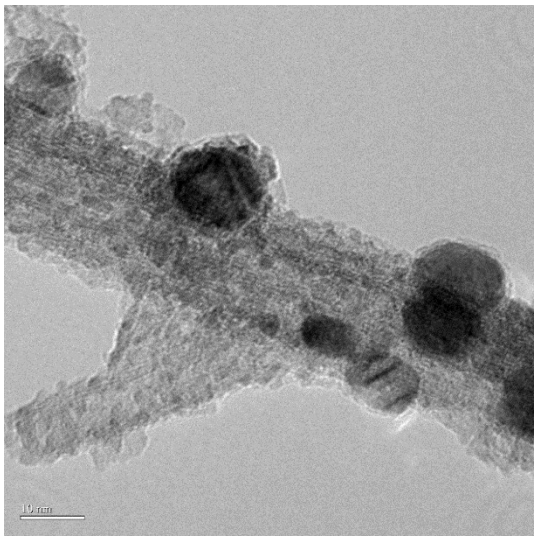

Figure S11. TEM image of Pd/HTNTs

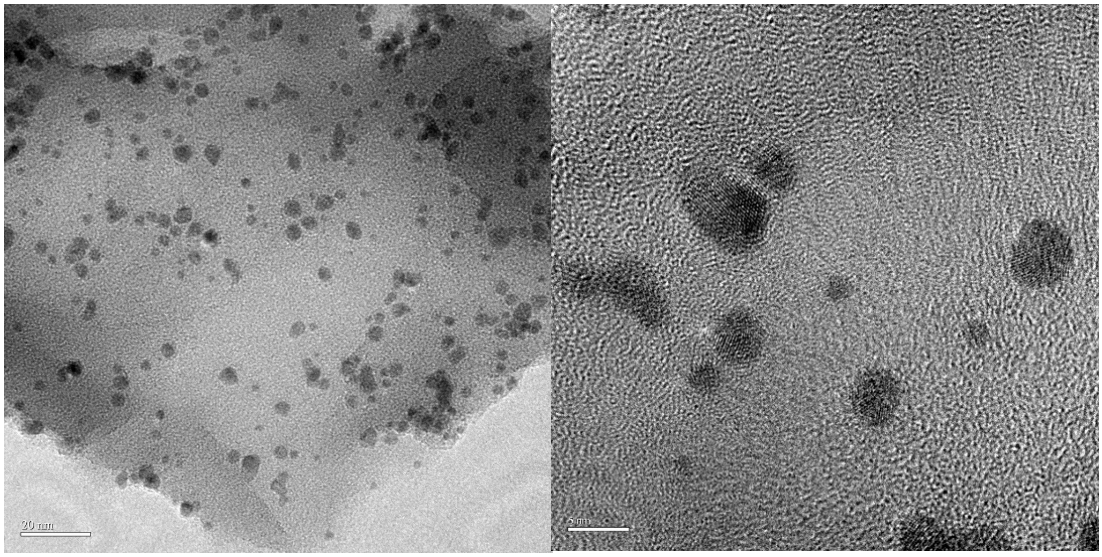

Figure S12. TEM image of Pd/g-C_3N_4 (After catalytic reaction)

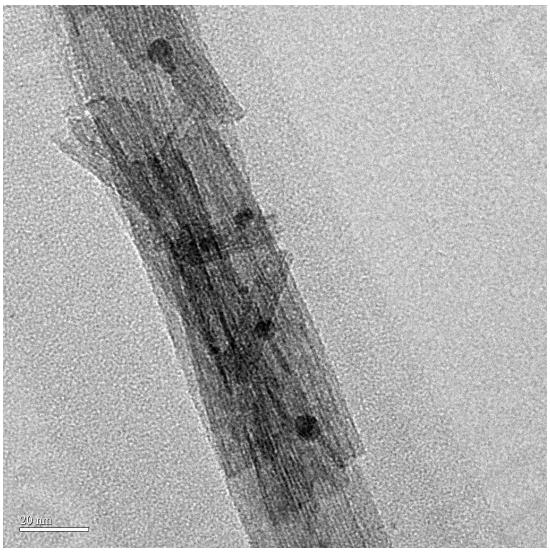

Figure S13. TEM image of Pd/HTNTs (After catalytic reaction)

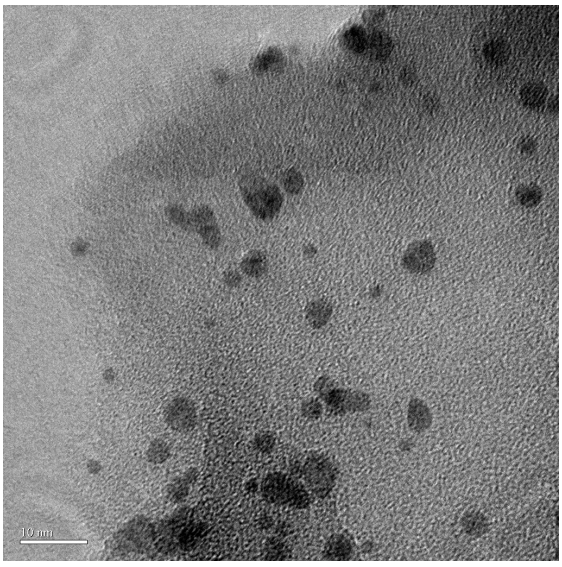

Figure S14. TEM image of Pt-Pd/HTNTs (After catalytic reaction)

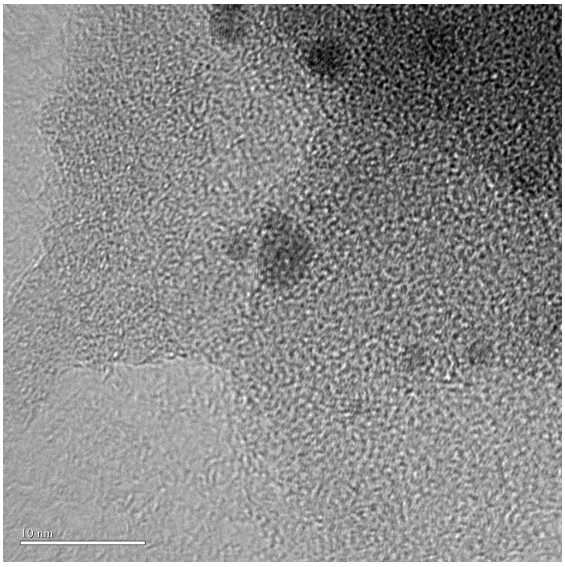

Figure S15. TEM image of Ag-Pd/HTNTs (After catalytic reaction)

S V. Statistics researches of the size range of metal NPs

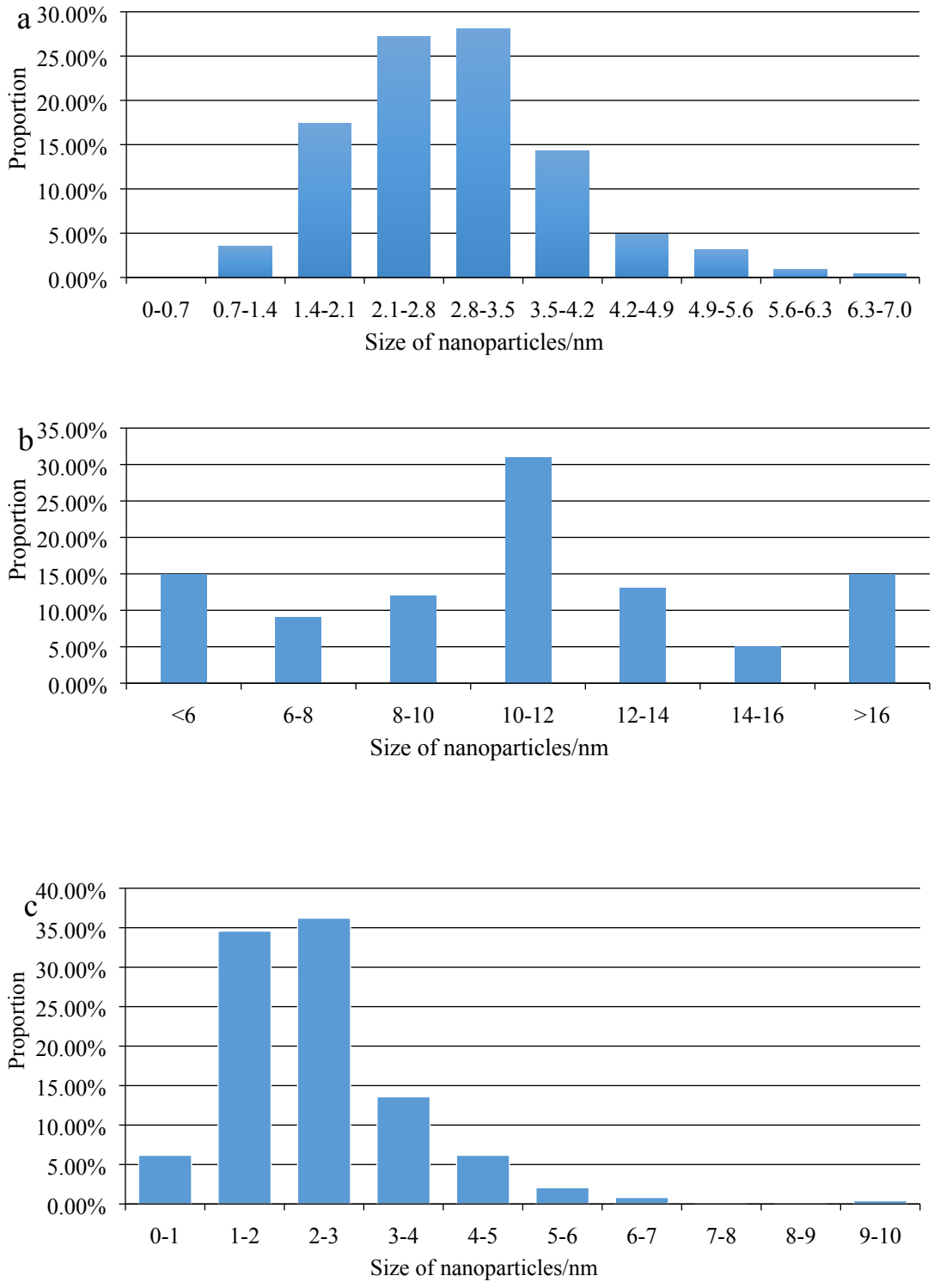

Chart S1. Statistics researches of the size range of metal NPs in Pd/g-C_3N_4 (a), Pd/HTNTs (b) and Pt-Pd/g-C_3N_4 (c)

S VI Kinetic curves

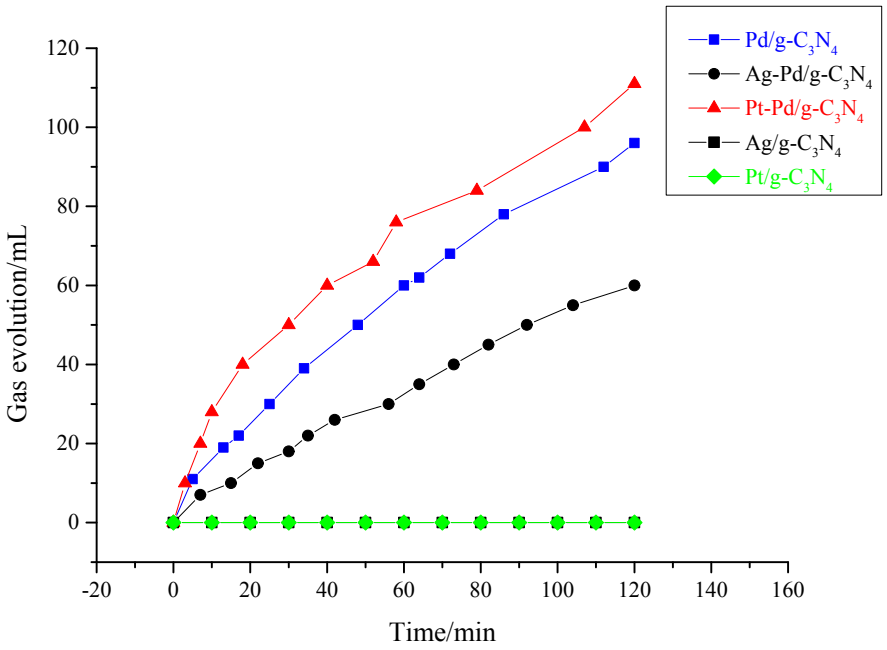

Figure S16. Gas generation of catalysts in first 2 h.

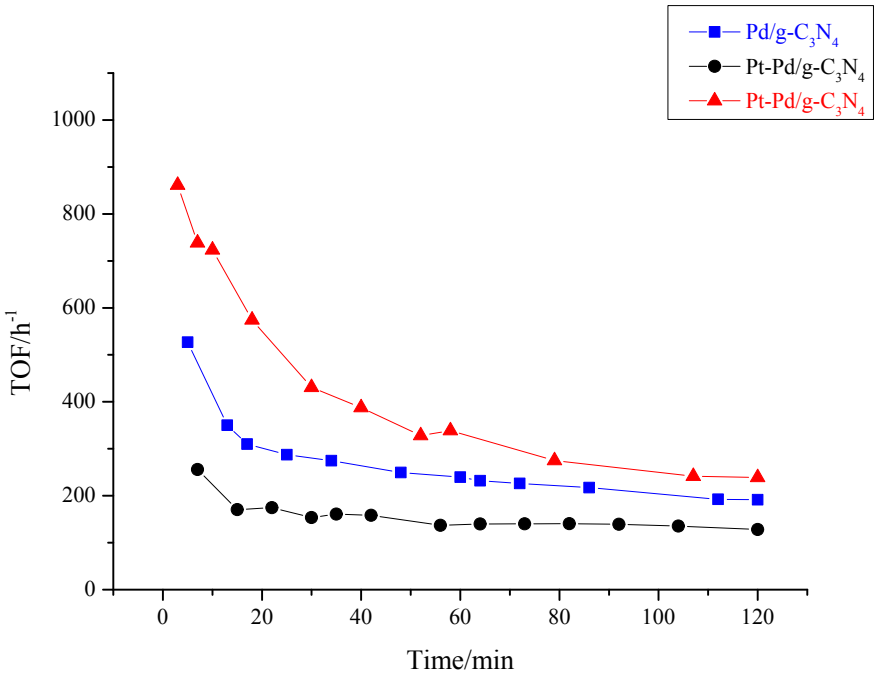

Figure S17. TOF of catalysts in first 2 h.

S VI. Result of GC

Because the reaction system is SF: FA=9:1, in such alkaline condition, CO_2 turns into HCO_3^-

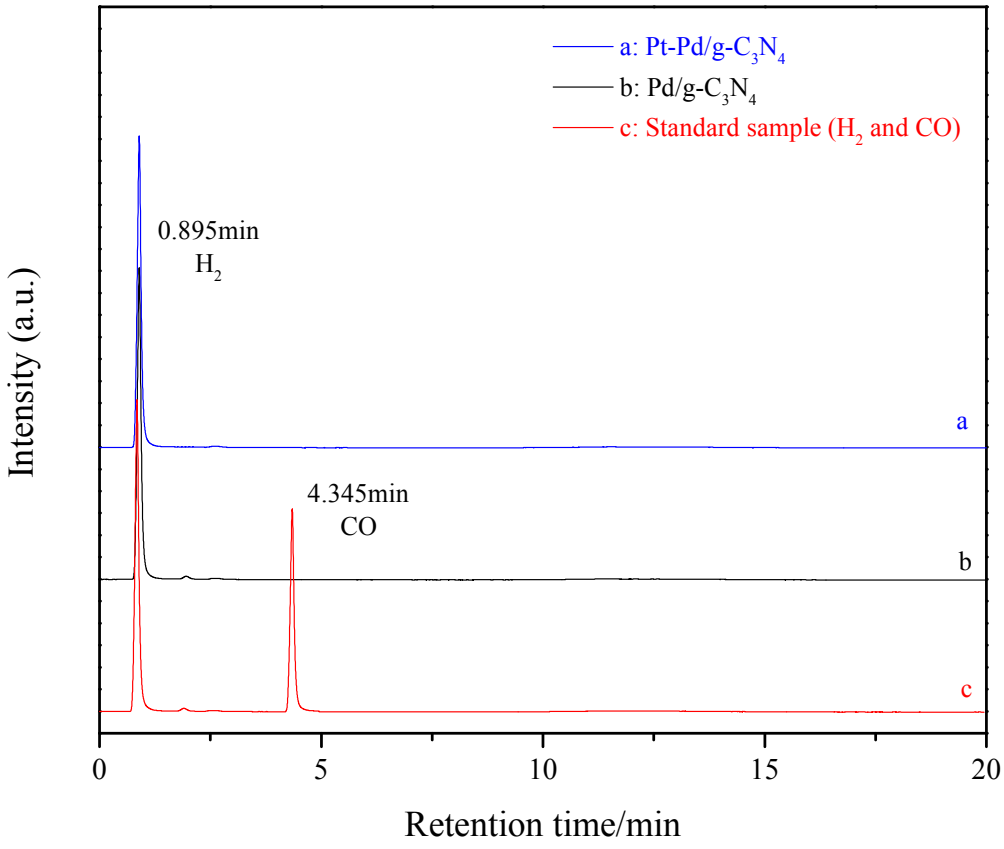

Figure S18. GC results of Pd/g-C_3N_4 and Pt-Pd/g-C_3N_4

Notes and references

1 Noack, K.; Zbinden, H. and Schlogl, R. *Catal. Lett.* 1990, **4**, 145.
2 Kumar, G.; Blackburn, J.R.; Albridge, R.G.; Moddeman, W.E. and Jones, M.M. *Inorg. Chem*. 1972, **11**, 296.
3 Tressaud. A.; Khairoun, S.; Touhara, H. and Watanabe, N. Z. *Anorg. Allg. Chem.* 1986, **540**, 291.