Supporting Information:

Surfactant-mediated One-pot Method to Prepare Pd-CeO$_2$ Colloidal Assembled Spheres and Its Enhanced Catalytic Performance for CO oxidation

Chenhao Du[1], Guanzhong Lu[1],* Yun Guo[1], Yanglong Guo[1], and Xue-qing Gong[1]

*[1]Key Laboratory for Advanced Materials and Research Institute of Industrial Catalysis, School of Chemistry and Molecular Engineering, East China University of Science and Technology, Shanghai 200237, P. R. China. *E-mail: gzhlu@ecust.edu.cn; Fax: +86 21 6425 2923*

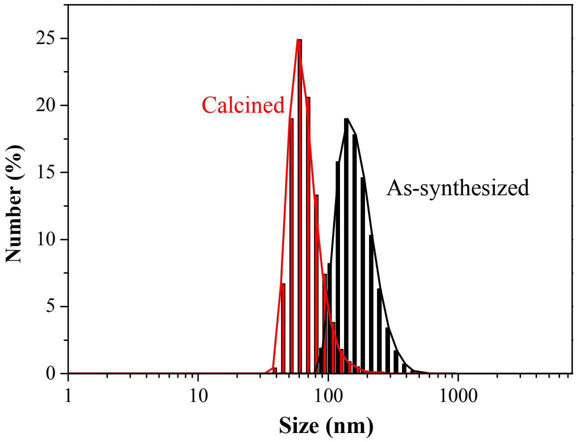

Figure S1. Size distribution of as-synthesized and calcined Pd-CeO$_2$ CASs at 600 °C.

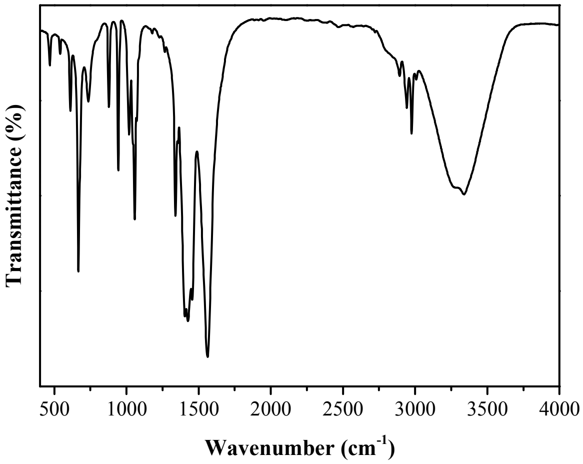

Figure S2. FT-IR spectrum of the sample after 1.5 h of the synthesis reaction. IR (KBr, cm^{-1}): 3340 v(O-H), 2942 and 2895 v(C-H) C$_2$H$_4$, 1562 v(OCO), 1425 v(C-C) as, 1057 v(C-O), 661 v(-(CH$_2$)$_3$-) PVP.

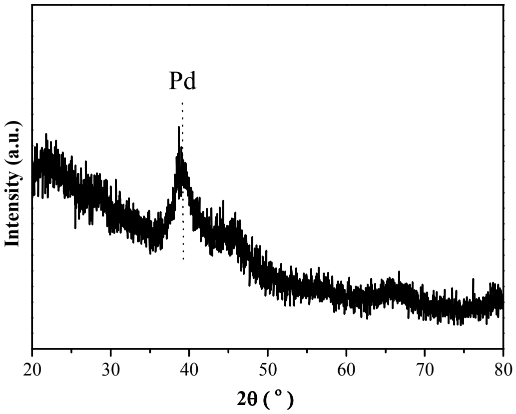

Figure S3. XRD pattern of the sample prepared at 130 °C for 15 h without adding NH_4OH.

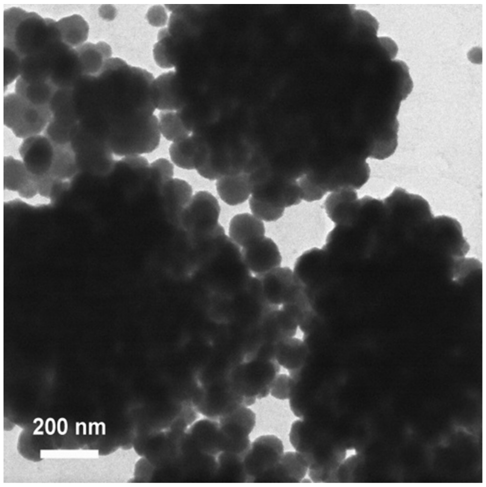

Figure S4. TEM image of the sample prepared at 130 °C for 15 h with 0.8 mL NH_4OH.

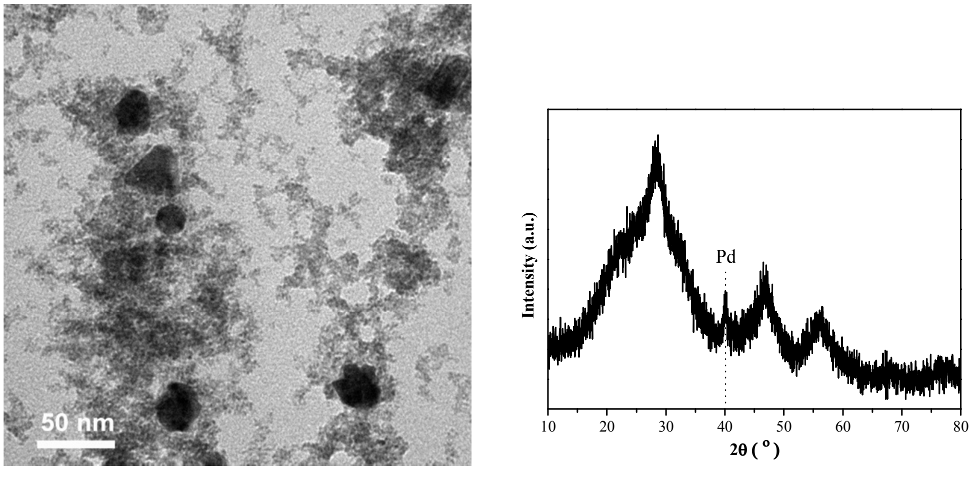

Figure S5. TEM image and XRD pattern of the sample prepared at 130 °C for 15 h without adding acetic acid and $N(CH_3)_4OH$.

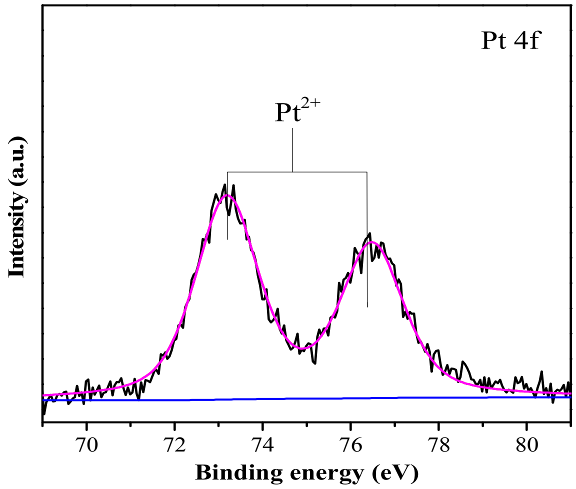

Figure S6. Pt 4f XPS spectrum of Pt-CeO$_2$ CASs. The peak at BE= 73 eV is corresponding to the ionic Pd^{2+} species.[1] This result showed that the exposed Pt species on the Pt-CeO$_2$ CASs existed in the form of ionic Pt^{2+}, which is caused by the strong interaction between Pt and CeO$_2$ during the synthesis process.

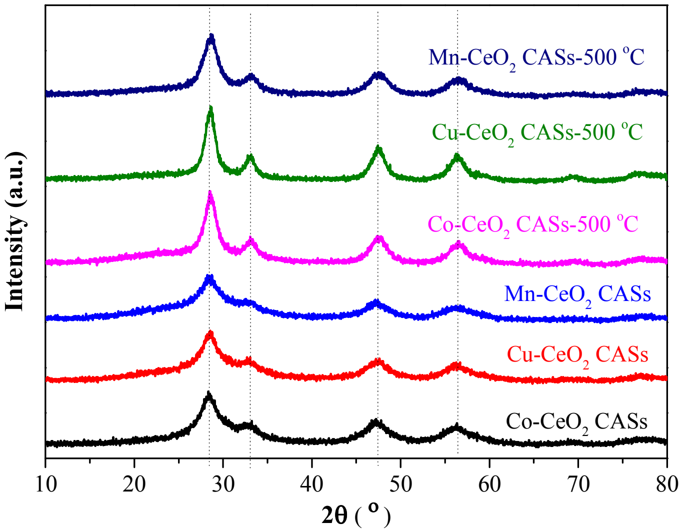

Figure S7. XRD patterns of as-synthesized and calcined (Cu, Co, Mn)-CeO$_2$ CASs at 500 °C.

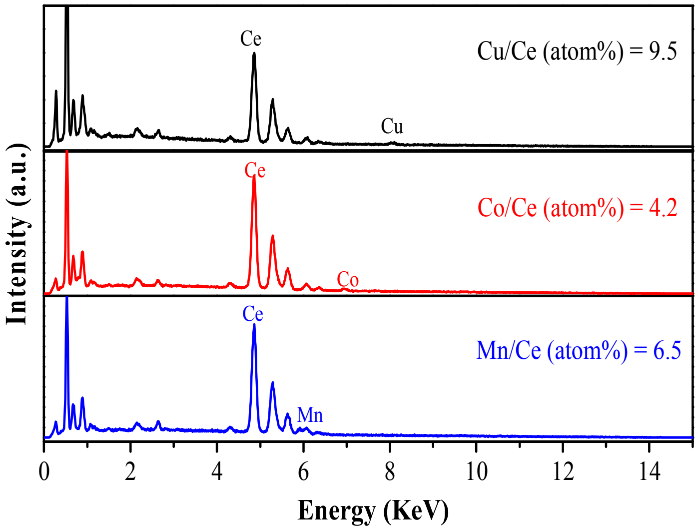

Figure S8. EDS spectra of M (Cu, Co, Mn)-CeO_2 CASs calcined at 500 °C. As shown in Figures S7 and S8, the Cu, Co, Mn-CeO_2 CASs samples exhibit the characteristic diffraction peaks of CeO_2, indicating the successful incorporation of transition metal elements in the CeO_2 CASs.

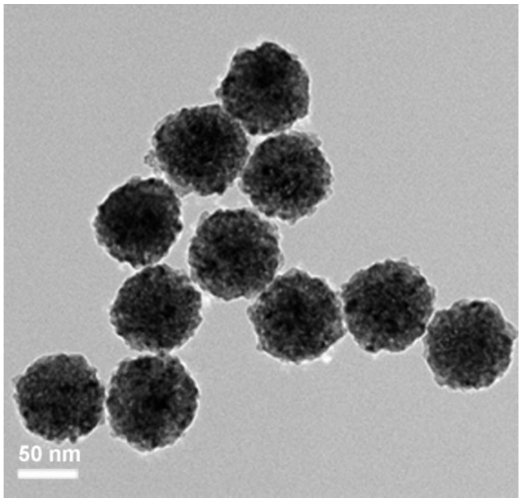

Figure S9. TEM image of Pd-CeO_2 CASs after cycling testing 3 times in CO oxidation.

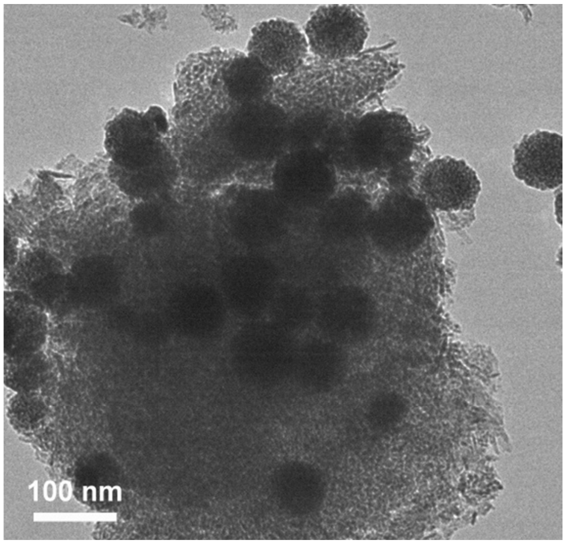

Figure S10. TEM image of Pd-CeO_2 CASs/Al_2O_3.

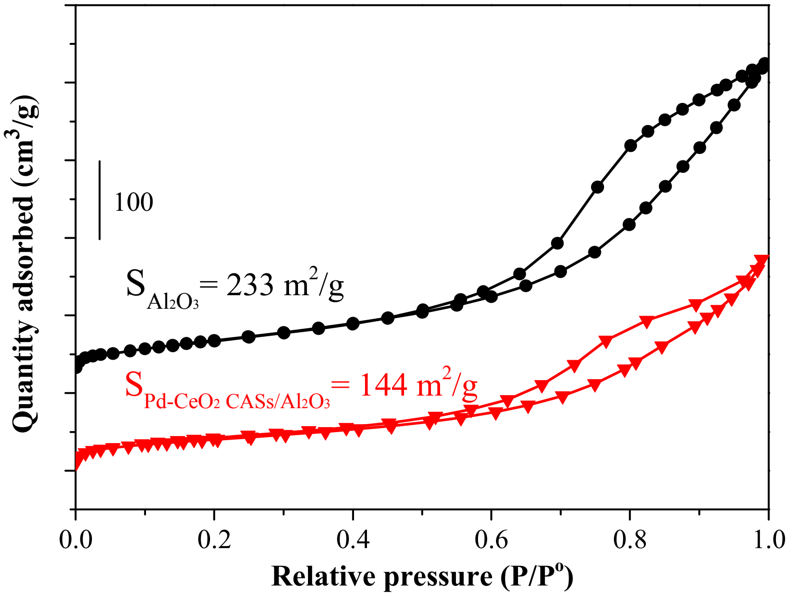

Figure S11. N_2 adsorption/desorption isotherms of Al_2O_3 and Pd-CeO_2 CASs/Al_2O_3. The BET surface areas of Al_2O_3 and Pd-CeO_2 CASs/Al_2O_3 are 233 m^2/g and 144 m^2/g respectively.

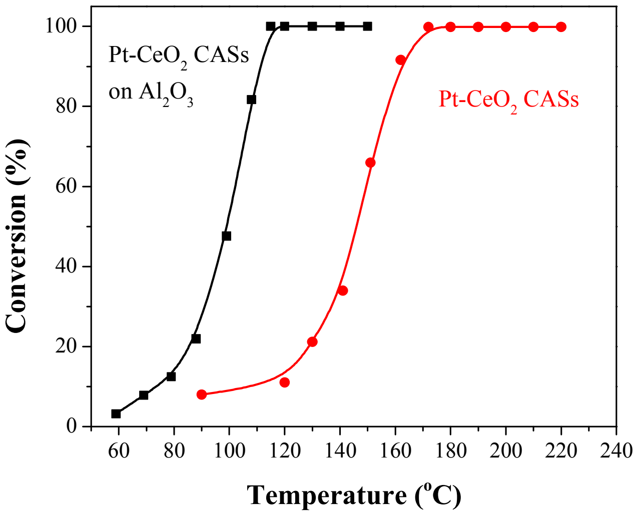

Figure S12. Catalytic activities of Pt-CeO$_2$ CASs and supported Pt-CeO$_2$ CASs/Al$_2$O$_3$ for CO oxidation.

Table S1. The composition of the sample after 1.5 h of reaction*

	C	H	O	N	Ce	Pd
Wt.(%)	27.4	3.8	35.6	1.1	31	1.1

* The C, H, N contents were measured by element analysis; Pd, Ce contents were measured by ICP. The O content was balanced by the weight ratio.

Reference

(1) Bruix, A.; Lykhach, Y.; Matolínová, I.; Neitzel, A.; Skála, T.; Tsud, N.; Vorokhta, M.; Stetsovych, V.; Ševčíková, K.; Mysliveček, J.; Fiala, R.; Václavů, M.; Prince, K. C.; Bruyère, S.; Potin, V.; Illas, F.; Matolín, V.; Libuda, J.; Neyman, K. M. Maximum Noble-Metal Efficiency in Catalytic Materials: Atomically Dispersed Surface Platinum. *Angew. Chem. Int. Ed.*, **2014**, *53*, 10525-10530.