

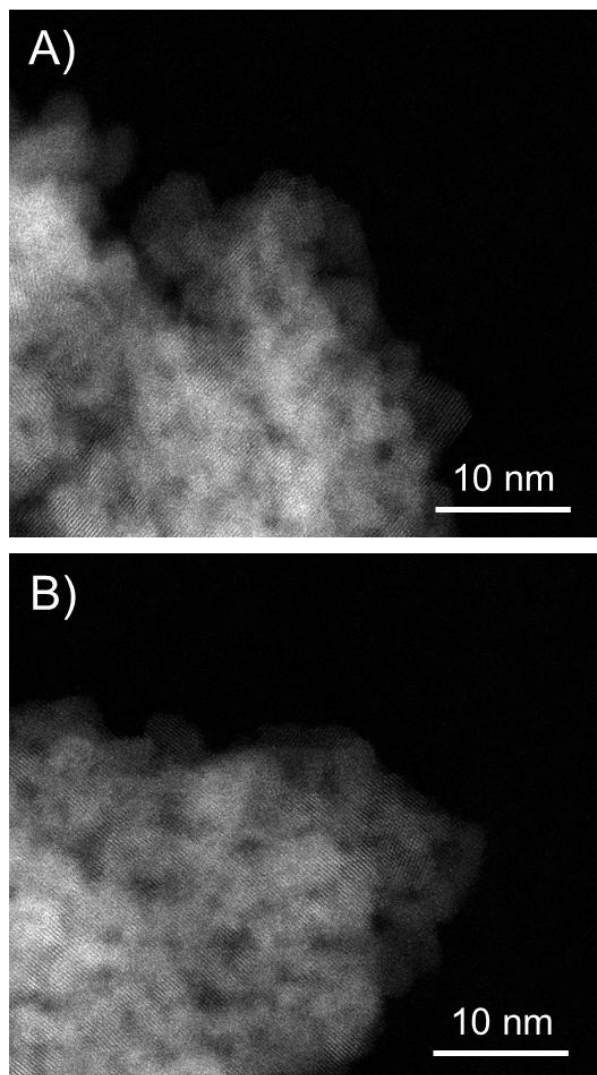
## Supporting Information

### **Effects of Morphology and Heteroatom Doping of CeO<sub>2</sub> Support on the Hydrogenation Activity of Pt Single-Atoms**

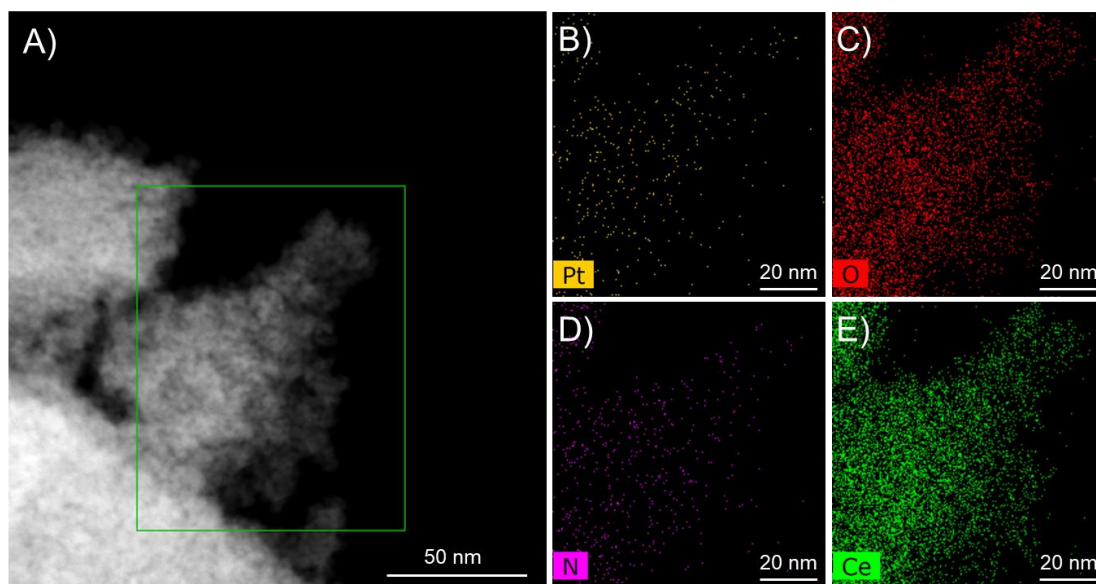
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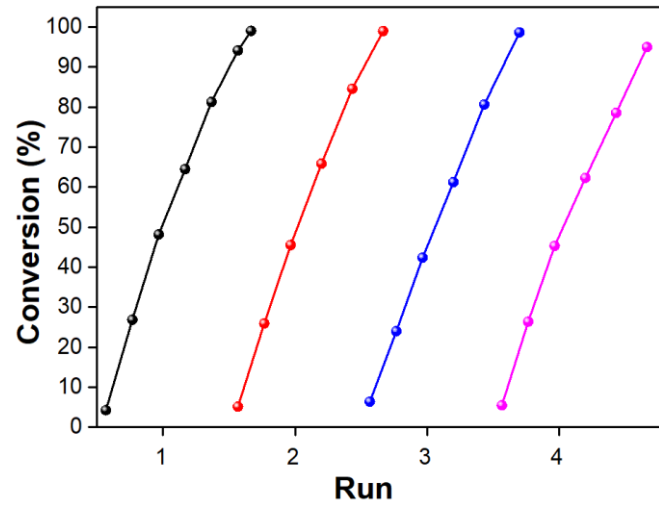
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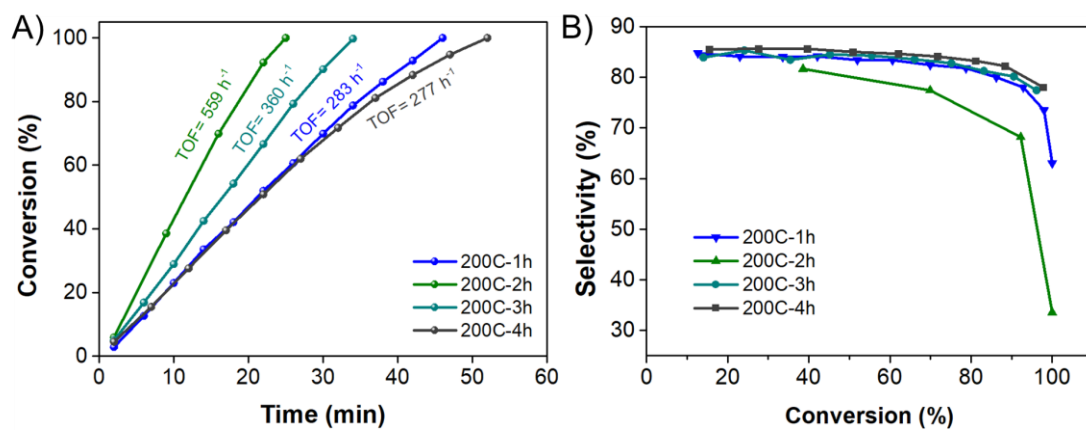
**Fig. S1.** Aberration-corrected HAADF-STEM images of Pt<sub>1</sub>/NO<sub>3</sub>-CeO<sub>2</sub>-sphere (A) and Pt<sub>1</sub>/PO<sub>4</sub>-CeO<sub>2</sub>-sphere (B) at low magnifications.



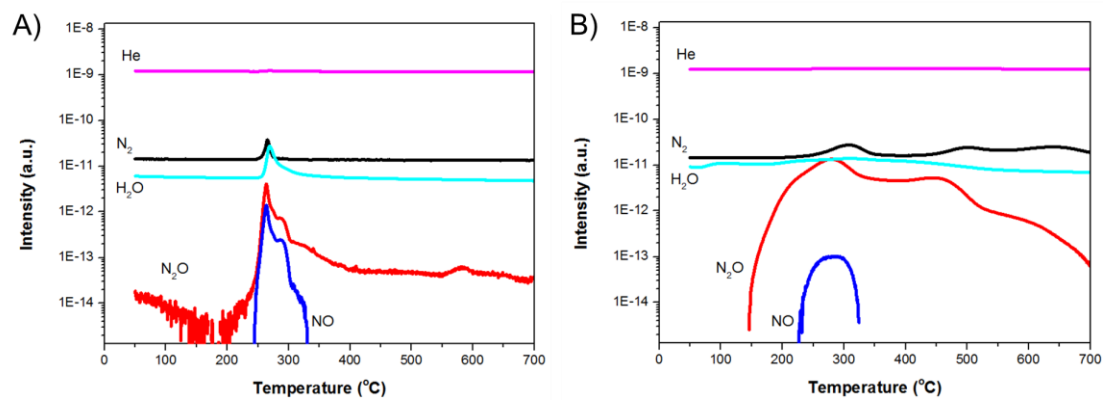
**Fig. S2.** STEM images of Pt<sub>1</sub>/NO<sub>3</sub>-CeO<sub>2</sub>-sphere (A) and the corresponding EDS mapping of Pt (B), O (C), N (D) and Ce (E) for the area marked by the green rectangle in (A).



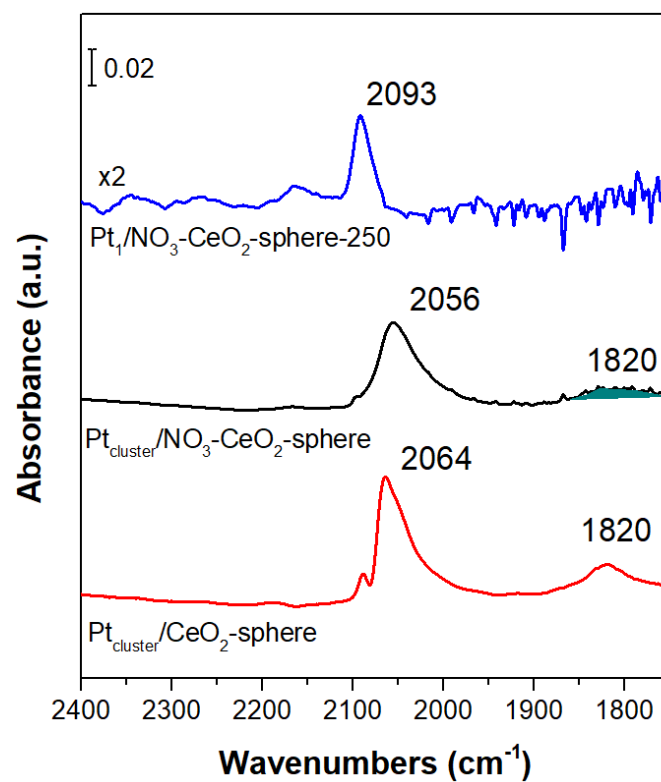
**Fig. S3.** Effect of recycle time on the catalytic performance of Pt<sub>1</sub>/NO<sub>3</sub>-CeO<sub>2</sub>-sphere.



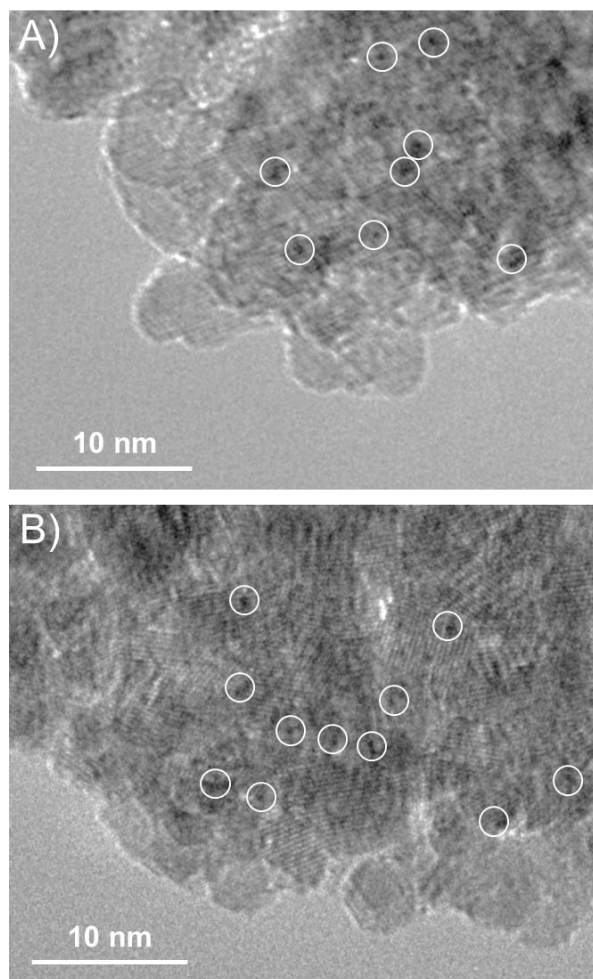
**Fig. S4.** The effect of calcination time on the activity (A) and styrene selectivity (B) of Pt/NO<sub>3</sub>-CeO<sub>2</sub>-sphere in phenylacetylene hydrogenation.



**Fig. S5.** Gaseous decomposition products from the temperature-programmed decomposition of platinum tetraaminonitrate (A) and NO<sub>3</sub>-CeO<sub>2</sub> (B) in a He atmosphere as determined by mass spectroscopy.

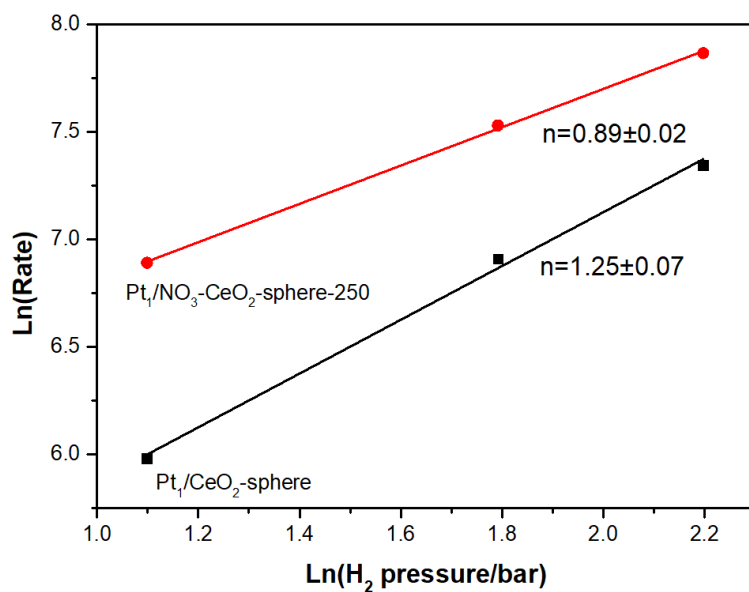


**Fig. S6.** DRIFTS of CO chemisorption on Pt<sub>1</sub>/NO<sub>3</sub>-CeO<sub>2</sub>-sphere-250, Pt<sub>cluster</sub>/NO<sub>3</sub>-CeO<sub>2</sub>-sphere and Pt<sub>cluster</sub>/CeO<sub>2</sub>-sphere.



**Fig. S7.** TEM images of (A)  $\text{Pt}_{\text{cluster}}/\text{NO}_3\text{-CeO}_2\text{-sphere}$  and (B)  $\text{Pt}_{\text{cluster}}/\text{CeO}_2\text{-sphere}$ . Pt nanoparticles are highlighted by white circles.





**Fig. S8.** Fitting curve between  $\ln(\text{Rate})$  of Pt SACs and  $\ln(\text{H}_2 \text{ pressure/bar})$  under different  $\text{H}_2$  pressures.