Supporting Information

Effects of Morphology and Heteroatom Doping of CeO$_2$ Support on the Hydrogenation Activity of Pt Single-Atoms

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**Fig. S1.** Aberration-corrected HAADF-STEM images of Pt$_1$/NO$_3$-CeO$_2$-sphere (A) and Pt$_1$/PO$_4$-CeO$_2$-sphere (B) at low magnifications.
**Fig. S2.** STEM images of Pt$_1$/NO$_3$-CeO$_2$-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/NO$_3$-CeO$_2$-sphere.
Fig. S4. The effect of calcination time on the activity (A) and styrene selectivity (B) of Pt/NO$_3$-CeO$_2$-sphere in phenylacetylene hydrogenation.
Fig. S5. Gaseous decomposition products from the temperature-programed decomposition of platinum tetraaminonitrate (A) and NO$_3$-CeO$_2$ (B) in a He atmosphere as determined by mass spectroscopy.
Fig. S6. DRIFTS of CO chemisorption on Pt$_1$/NO$_3$-CeO$_2$-sphere-250, Pt$_{cluster}$/NO$_3$-CeO$_2$-sphere and Pt$_{cluster}$/CeO$_2$-sphere.
Fig. S7. TEM images of (A) Pt\textsubscript{cluster}/NO\textsubscript{3}-CeO\textsubscript{2}-sphere and (B) Pt\textsubscript{cluster}/CeO\textsubscript{2}-sphere. Pt nanoparticles are highlighted by white circles.
**Fig. S8.** Fitting curve between ln(Rate) of Pt SACs and ln(H₂ pressure/bar) under different H₂ pressures.