Supporting Information

Interfacial Reaction-Directed Synthesis of Ceria Nanotube-embedded Ultra-small Pt Nanoparticle Catalyst with High Catalytic Activity and Thermal Stability

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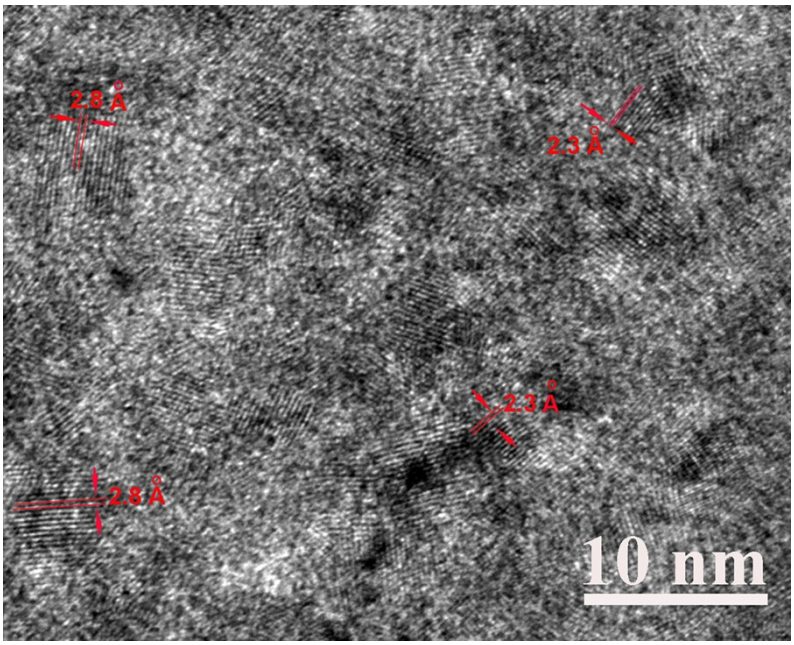

Fig. S1. HRTEM image of the CeO_2-Pt nanotube. The lattice spacing of the (111) plane of Pt and the lattice spacing of the (200) of CeO_2 can be clearly discerned.

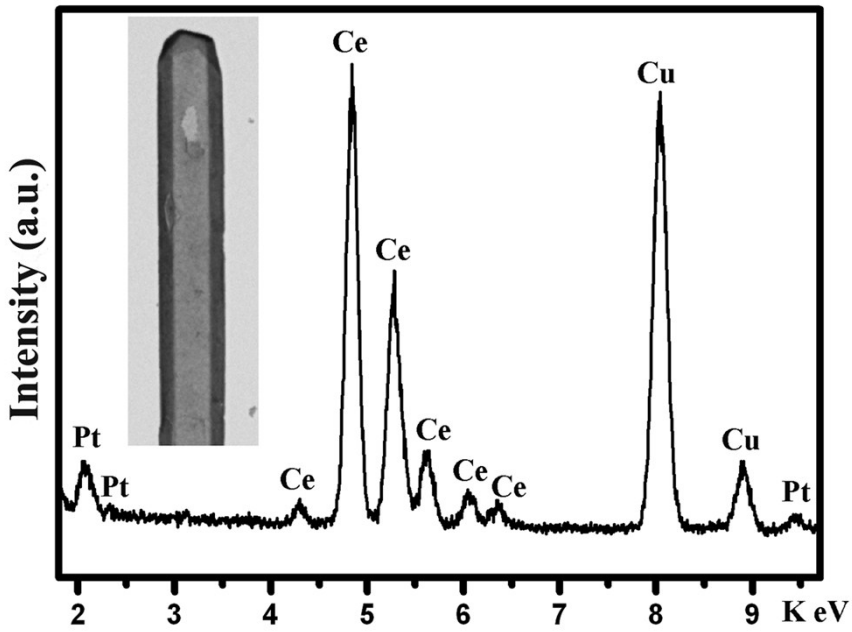

Fig. S2. EDX pattern of one individual CeO_2-Pt nanotube. The inset shows the corresponding TEM image of the selected CeO_2-Pt nanotube.

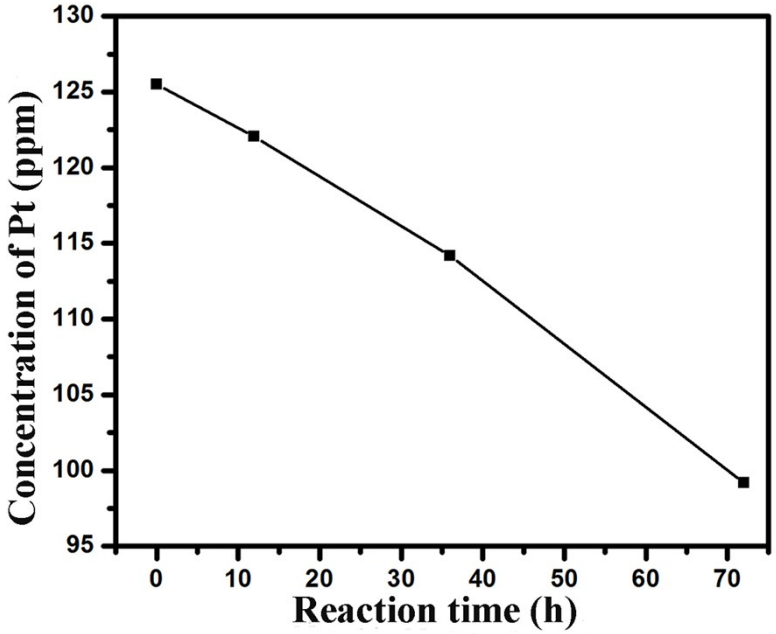

Fig. S3. The concentration of Pt in the reaction solution changes with the reaction time. The concentration of Pt was calculated from ICP-MS analysis.

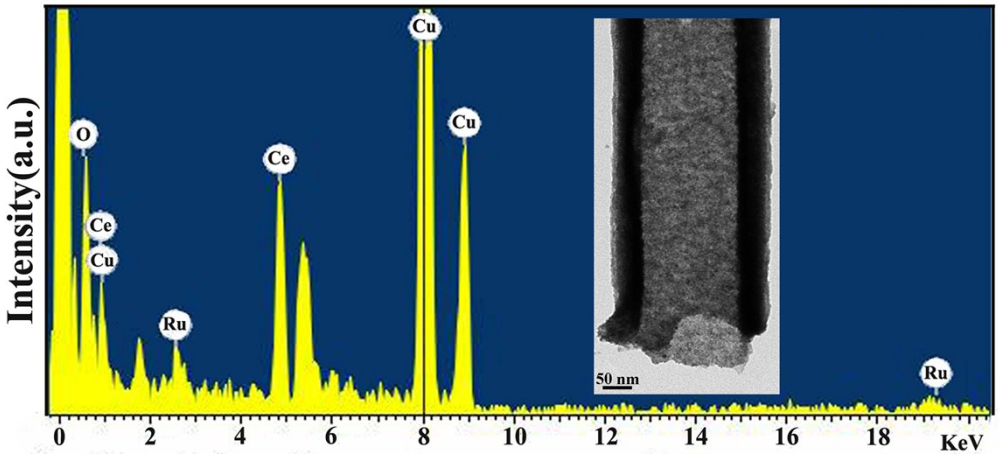

Fig. S4. EDX pattern of one individual CeO_2-Ru nanotube. The illustration is the corresponding TEM image of the selected CeO_2-Ru nanotube.

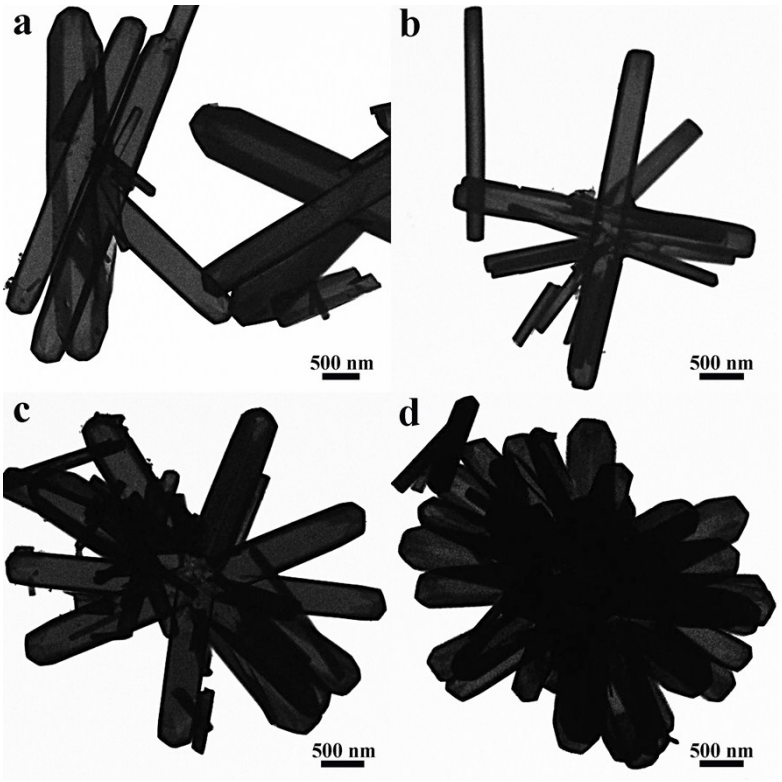

Fig. S5. TEM image of the CeO_2-Pt nanotube after calcination in air for 2 h at a) 500, b) 600, c) 700, and d) 800 °C.

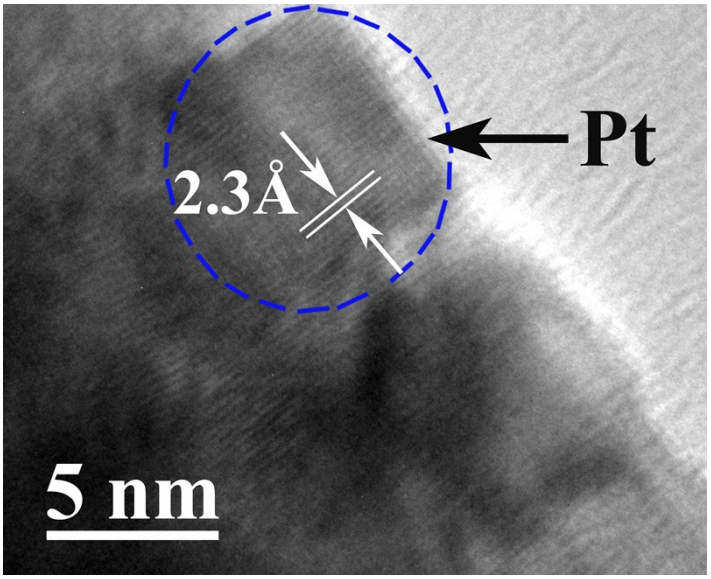

Fig. S6. HRTEM image of the CeO_2-Pt nanotube after calcination in air at 800 °C for 2 h.

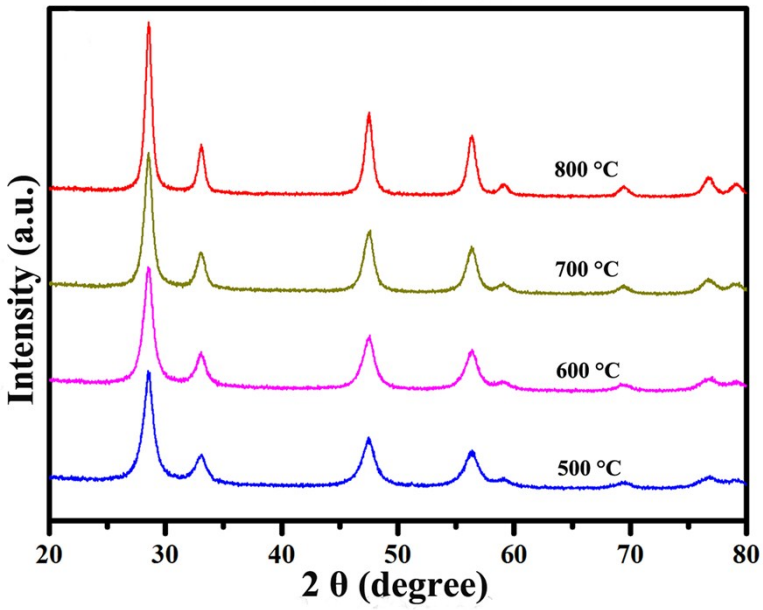

Fig. S7. XRD patterns of pure CeO_2 nanotubes treated at 500, 600, 700, and 800 °C for 2 h.

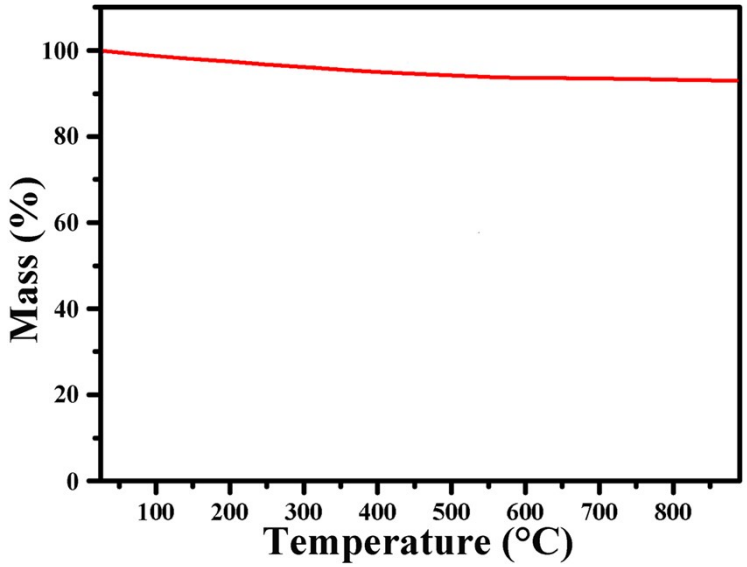

Fig. S8. TG curve for CeO_2-Pt nanotube catalyst uncalcined in the temperature range of 25-850°C and at a heating rate of 10°C/min in Ar atmosphere.

	500 °C	600 °C	700 °C	800 °C
CeO_2 nanotubes	6.1 nm	6.7 nm	8.5 nm	11.4 nm
CeO_2-Pt nanotubes	5.3 nm	5.2 nm	5.2 nm	7.1 nm

Table S1. Particle size was estimated by Sherrer equation using the (220) crystal plane of CeO_2.

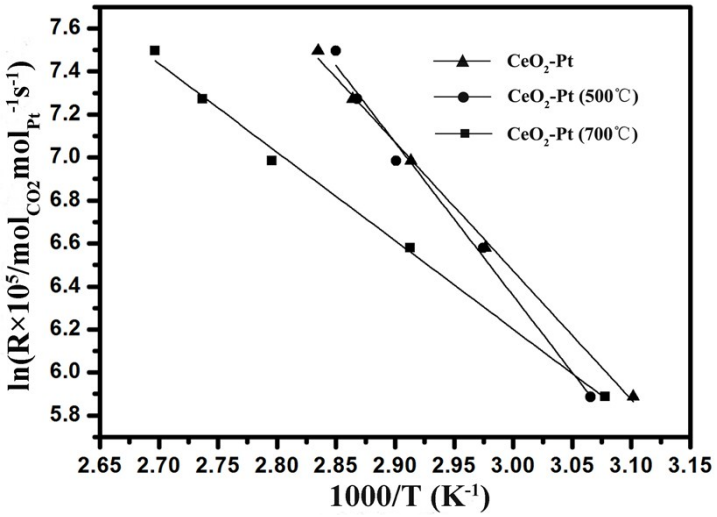

Fig. S9. Arrhenius plots for the CO oxidation over CeO_2-Pt catalysts before and after calcination in air at 500 and 700 °C for 2 h. Conversions of CO to CO_2 were calculated from the data (X_{CO}) from the online infrared gas analyzer for CO according to X_{CO}= (1 - A_{CO} / A_{CO*}) × 100 (%), where A_{CO*} and A_{CO} are the data of CO before and after the reaction, respectively. The reaction rate (R, mol of CO_2 (mol of Pt s) $^{-1}$) was calculated as follows: R = X_{CO} × F_{CO} / M_{Pt}. F_{CO} (mol s^{-1}) is the flow rate of CO in reactant gas, and M_{Pt} is the amount of Pt (mol) in the used catalyst (20 mg).

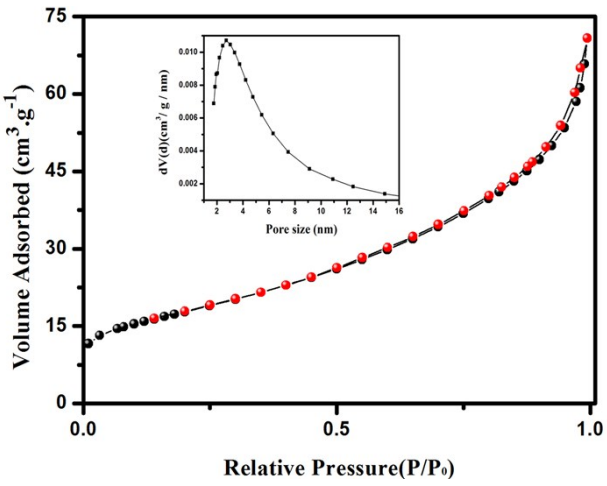

Fig. S10. Nitrogen adsorption–desorption isotherm and the corresponding BJH pore size distribution for the CeO_2-Pt sample.

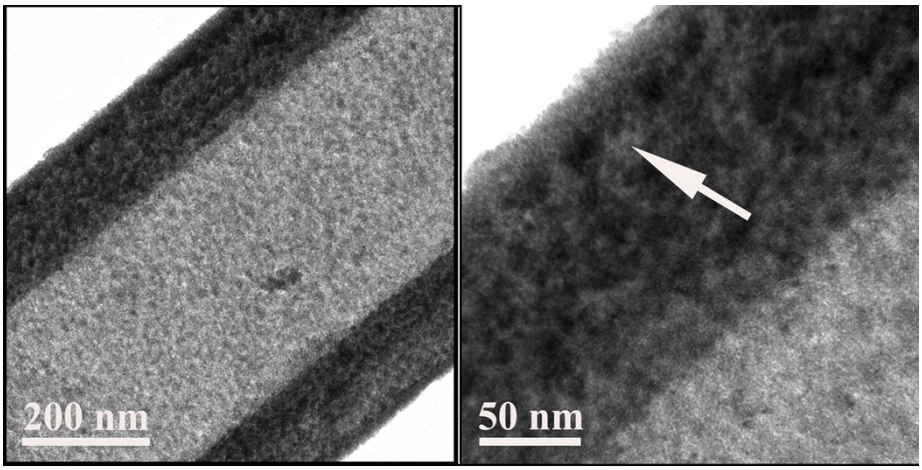

Fig. S11. HRTEM images of the CeO_2-Pt, where the pores can be clearly identified (marked by the white arrow).

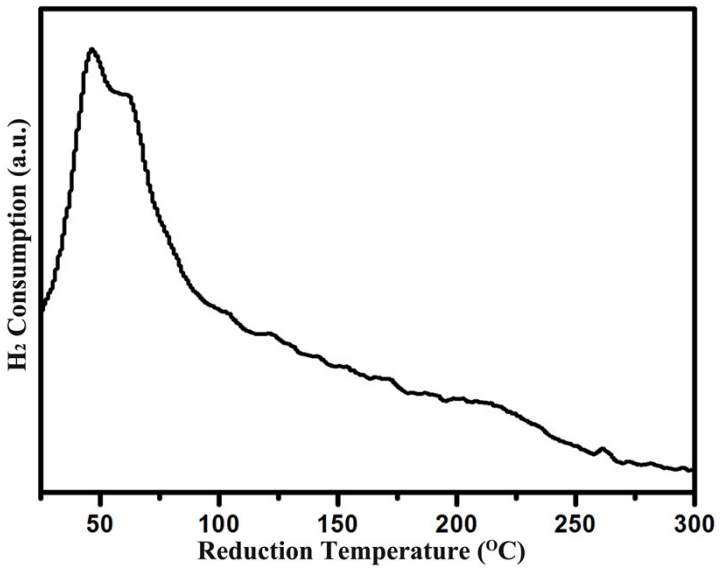

Fig. S12. H_2-TPR profile of the CeO_2-Pt nanotube catalyst.

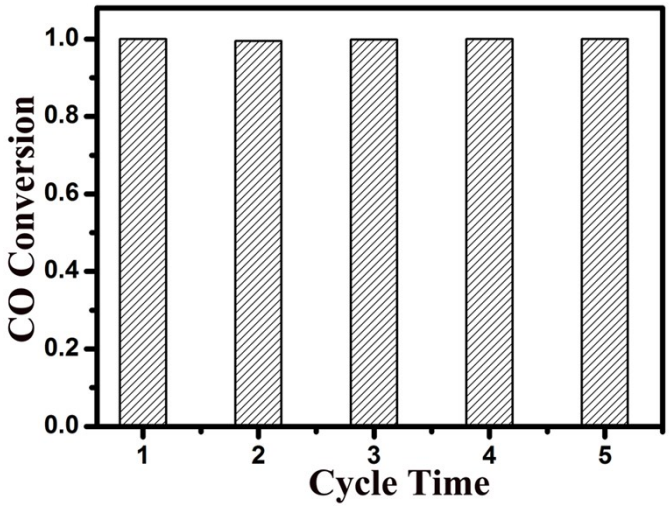

Fig. S13. Catalytic cycles of the as-prepared uncalcined CeO_2-Pt catalyst at 160 °C.