Electronic Supplementary Information

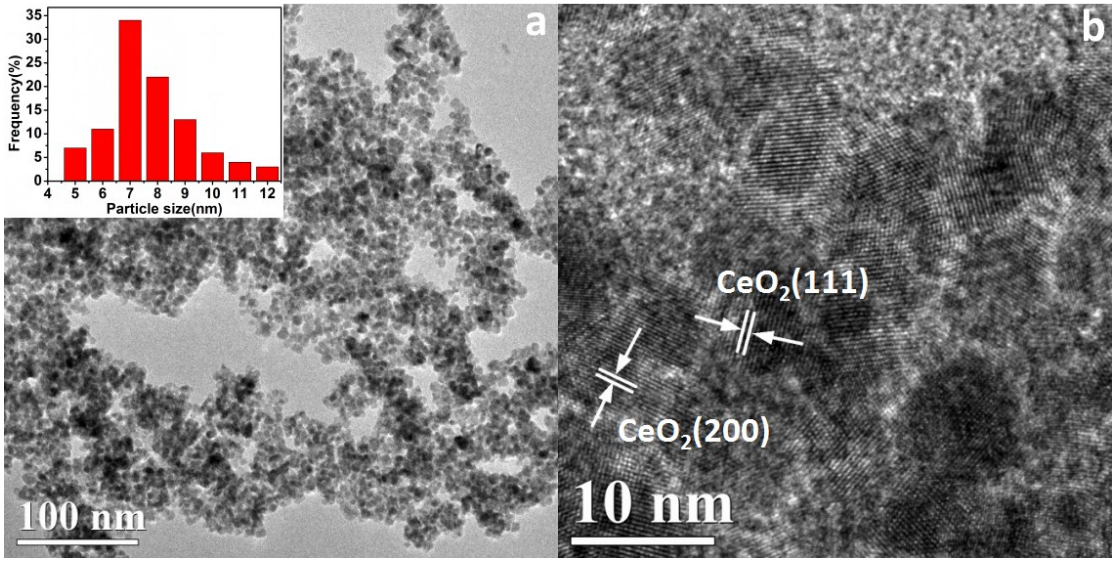

Fig. S1 (a) TEM and (b) HRTEM images of CeO_2 nanoparticles by calcining the $CeO_2 \cdot xH_2O$ nanoparticles at 400 ℃. Inset in FS1(a) is particle size distribution of the CeO_2 nanoparticles.

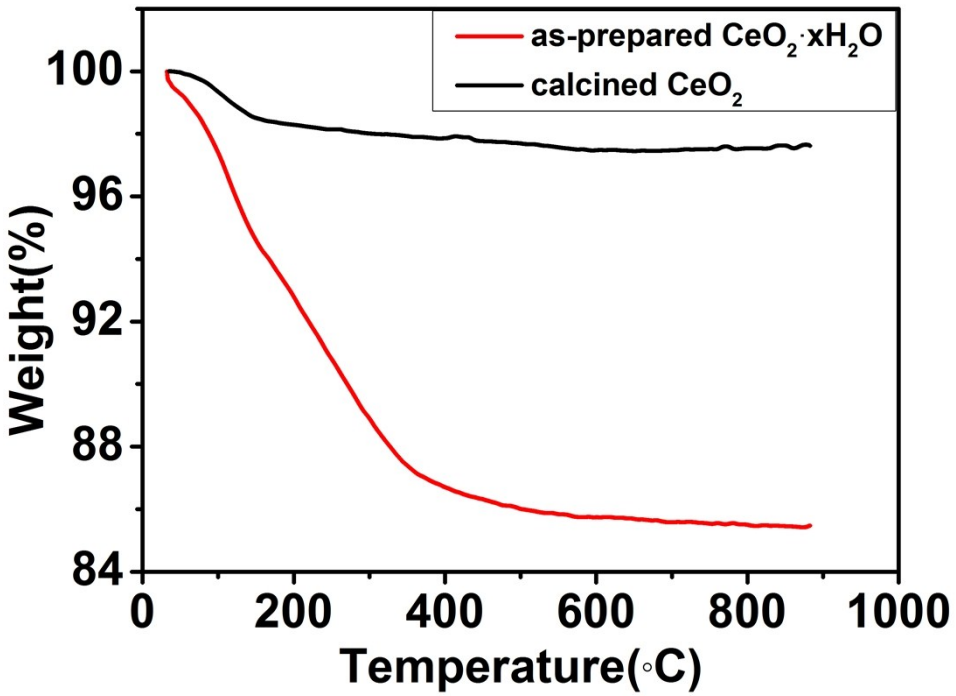

Fig. S2 TGA curves of as-prepared $CeO_2 \cdot xH_2O$ nanoparticles and calcined CeO_2 nanoparticles.

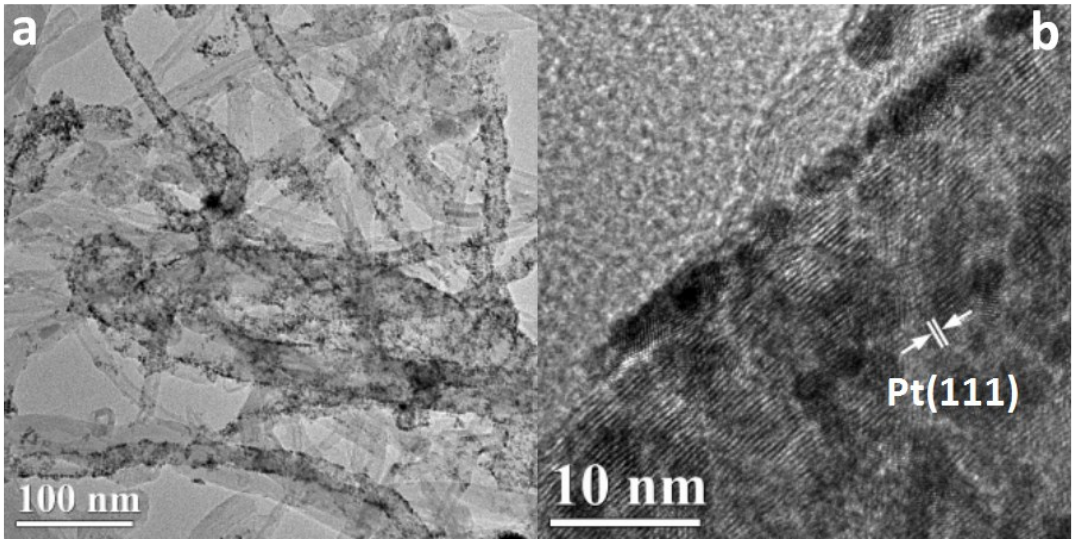

Fig. S3 The TEM and HRTEM images of Pt/CNTs catalyst.

Table S1 Comparison of methanol oxidation behavior in alkaline electrolytes on the various electrocatalysts.

Catalyst	Mass / specific activity	ESCA(m^2/g)	Scan rate (mV/s)	Electrolyte	Reference
Pt/CNTs + $CeO_2 \cdot xH_2O$	2304mA/mg		20mV/s	1M KOH + 1M CH_3OH	This work
Pt/$Ni(OH)_2$/rGO	1236mA/mg	64.1	20mV/s	1M KOH + 1M CH_3OH	1
Pt/CeO_2/rGO	1140mA/mg		50mV/s	1M KOH + 1M CH_3OH	2
Pt/CeO_2/C	36mA/cm^2		50mV/s	1M KOH + 1M CH_3OH	3
Pt-Mn_3O_4-MWCNT	970.2mA/mg	64.8m^2/g	50mV/s		4
Pt-TiO_2/ITO	1.94mA/cm^2		50mV/s	1M KOH + 1M CH_3OH	5
Pt-TiO_2/RGO	1.36mA/cm^2		50mV/s	0.5M KOH +1M CH_3OH	6
Pd/MnO_2/graphene	838mA/mg	82.6m^2/g	50mV/s	0.5M KOH + 1M CH_3OH	7
Pd-CeO_2/C	36.6mA/cm^2		50mV/s	1M KOH + 1M CH_3OH	8
Pt/$In_{0.1}SnO_2$	2320mA/mg	43m^2/g	20mV/s	0.5M KOH + 2M CH_3OH	9
$Pt_{3.5}Pb$	2840mA/mg		50mV/s	0.5M KOH + 1M CH_3OH	10
porous Pt_1Cu_3/1-aminopyrene-graphene	2750mA/mg	76.58m^2/g	50mV/s	1M KOH + 0.5M CH_3OH	11
Mesoporous Co-Pt films	4.3 mA/cm^2		50mV/s	1M NaOH + 1M CH_3OH	12
PtNi/C	1200mA/mg		50mV/s	1M NaOH + 2M CH_3OH	13
PtAg/C	3mA/mg	56m^2/g	20mV/s	0.5M KOH + 2M CH_3OH	14

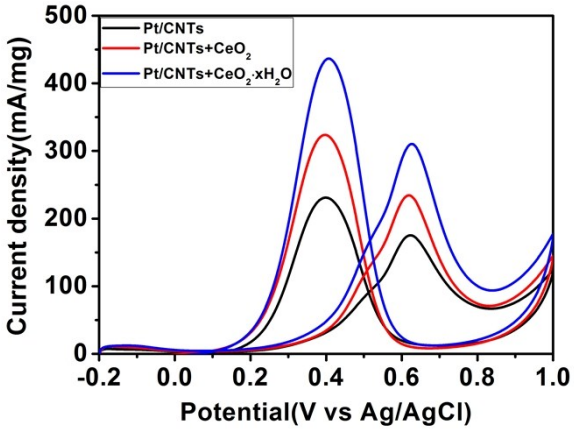

Fig. S4 Cyclic voltammetry curves of Pt/CNTs + $CeO_2 \cdot xH_2O$, Pt/CNTs + CeO_2 and Pt/CNTs catalysts in 0.5M H_2SO_4 and 0.5M CH_3OH with a scan rate of 20 mV/s.

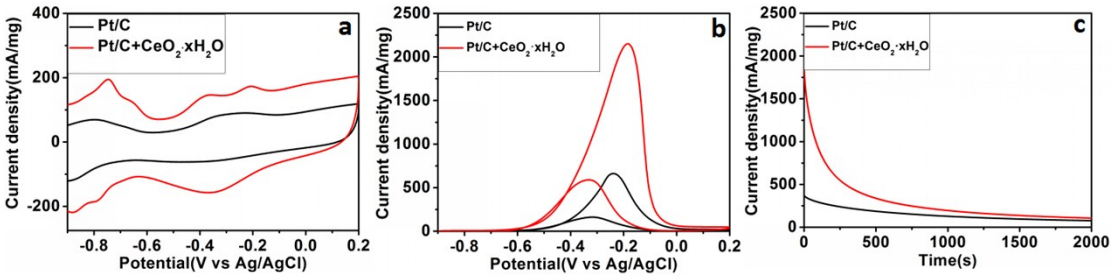

Fig. S5 (a) Cyclic voltammetry curves of methanol electro-oxidation for Pt/C and Pt/C+$CeO_2 \cdot xH_2O$ in 1M KOH with a scan rate of 200 mV/s. (b) Cycle voltammetry curves of all the catalysts in 1M KOH and 1M CH_3OH in the potential of -0.9V to 0.2V with a scan rate of 20 mV/s. (c) Chronoamperometric curves of all the catalysts in 1M KOH and 1M CH_3OH.

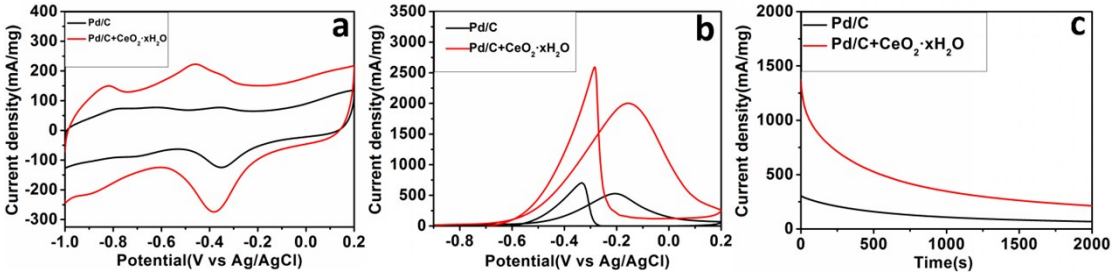

Fig. S6 (a) Cyclic voltammetry curves of methanol electro-oxidation for Pd/C and Pd/C+$CeO_2 \cdot xH_2O$ on the all catalysts in 1M KOH with a scan rate of 200mV/s. (b) Cycle voltammetry curves of all the catalysts in 1M KOH and 1M CH_3CH_2OH in the potential of -0.9V to 0.2V with a scan rate of 20mV/s. (c) Chronoamperometric curves of all the catalysts in 1M KOH and 1M CH_3CH_2OH.

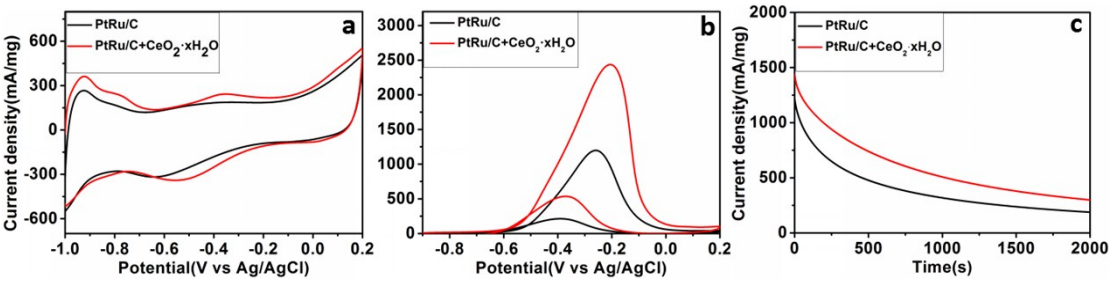

Fig. S7 (a) Cyclic voltammetry curves of methanol electro-oxidation for PtRu/C and PtRu/C+$CeO_2 \cdot xH_2O$ catalysts in 1M KOH with a scan rate of 200mV/s. (b) Cycle voltammetry curves of all the catalysts in 1M KOH and 1M CH_3OH in the potential of -0.9V to 0.2V with a scan rate of 20mV/s. (c) Chronoamperometric curves of all the catalysts in 1M KOH and 1M CH_3OH.

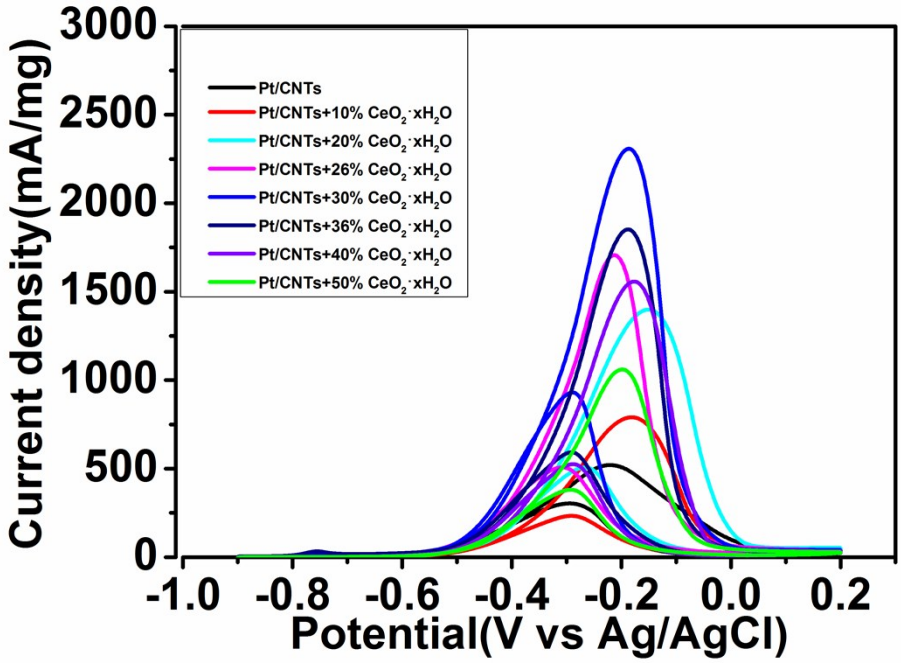

Fig. S8 CVs of methanol electrooxidation in a N_2-saturated solution of 1.0 M KOH and 1.0 M CH_3OH on the Pt/CNTs and Pt/CNTs + $CeO_2 \cdot xH_2O$ catalysts prepared with different ratio of $CeO_2 \cdot xH_2O$. The scan rate is 20 mV/s.

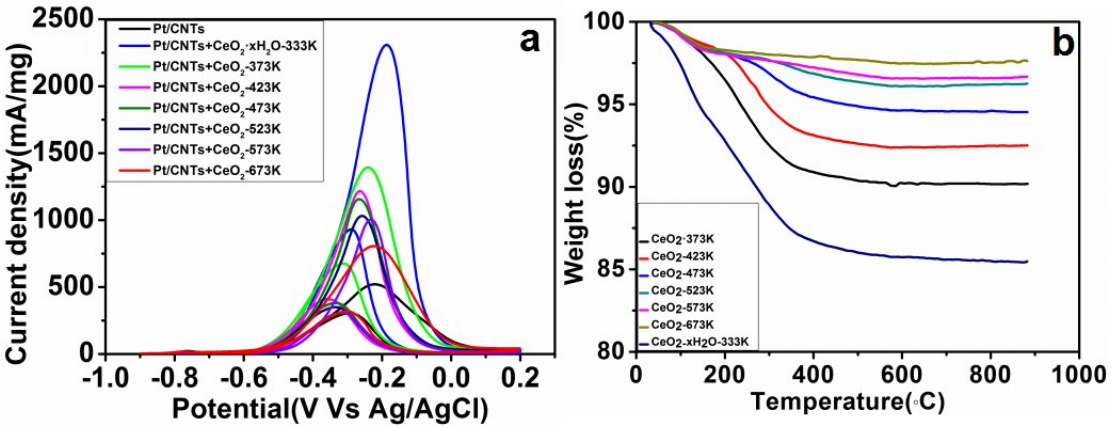

Fig. S9 (a) CVs of Pt/CNTs + $CeO_2 \cdot xH_2O$ catalysts prepared with distinct $CeO_2 \cdot xH_2O$ calcined at different temperature. (b) TGA curves of the distinct $CeO_2 \cdot xH_2O$ nanoparticles.

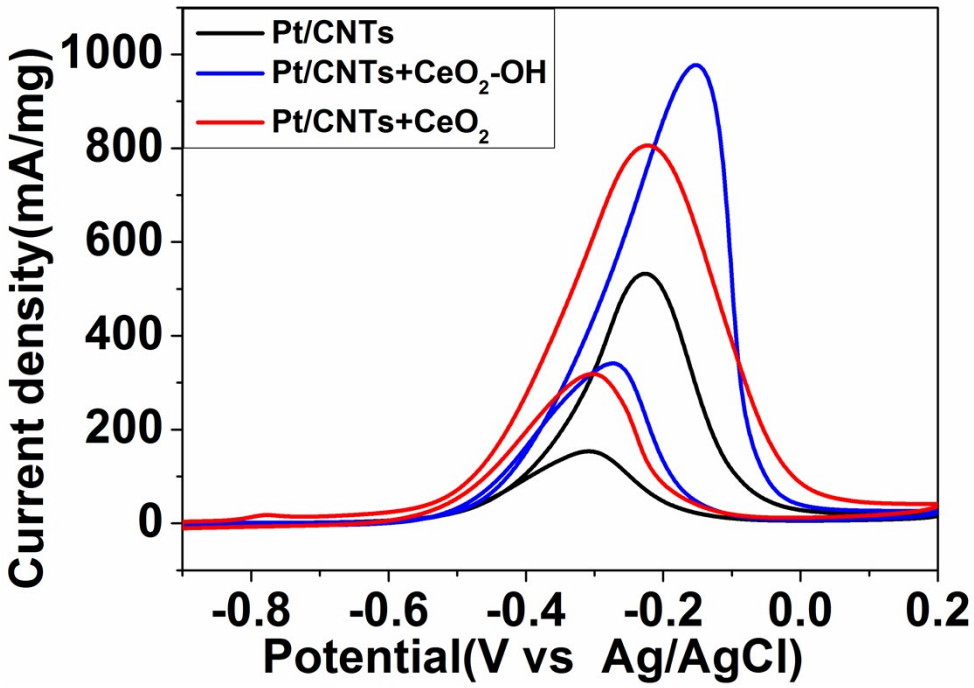

Fig. S10 CVs of Pt/CNTs, Pt/CNTs + CeO_2, Pt/CNTs + CeO_2-OH in 1.0 M KOH + 1.0 CH_3OH with a scan rate of 20 mV/s. CeO_2-OH was obtained by stirring CeO_2 nanoparticles in 1.0 M NaOH solution for 1 h.

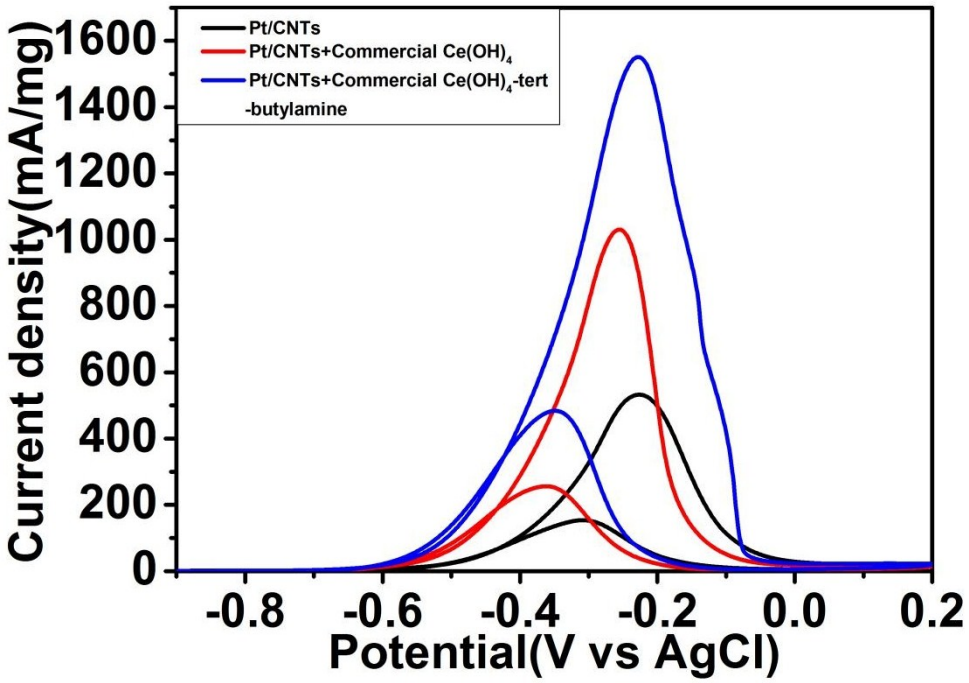

Fig. S11 CVs of Pt/CNTs, Pt/CNTs + commercial $Ce(OH)_4$ and Pt/CNTs + $Ce(OH)_4$-*tert*-butylamine in 1.0 M KOH + 1.0 CH_3OH with a scan rate of 20 mV/s.

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