Electronic supplementary information

Optimizing the synergy between alloy and alloy-oxide interface for CO oxidation in bimetallic catalysts

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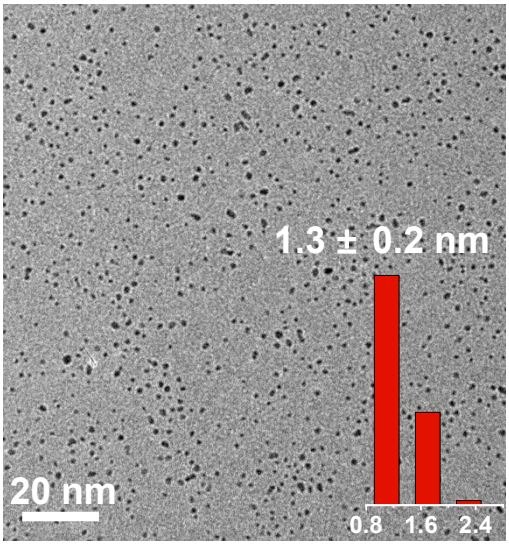

Figure S1. TEM images of the as-synthesized colloidal Pt nanoparticles.

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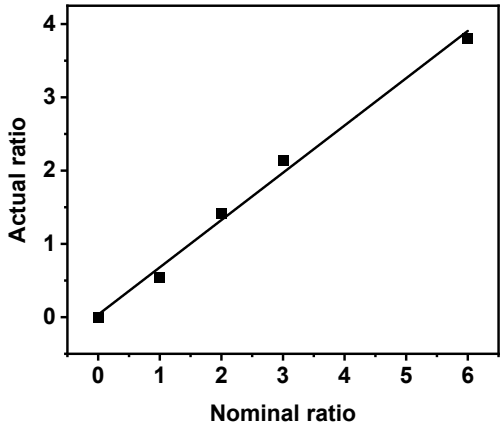

Figure S2. The linear fitting result of nominal ratio and actual ratio of Pt and Co for a series of the Pt_1Co_x/Al_2O_3 catalysts.

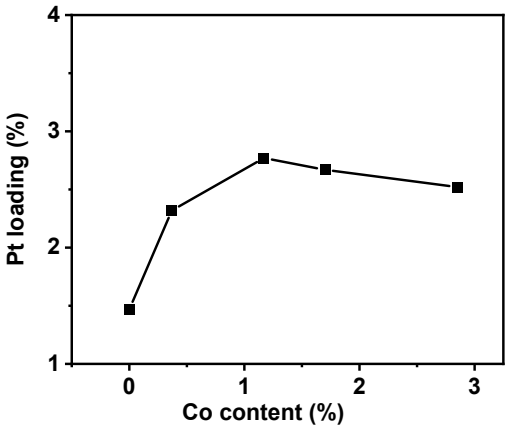

Figure S3. The relationship between the actual loadings of Pt and Co in the Pt_1Co_x/Al_2O_3 catalysts.

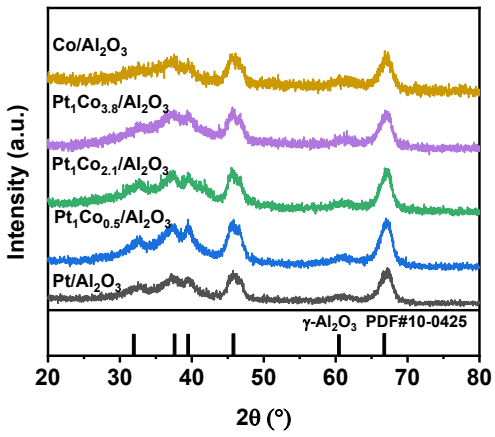

Figure S4. XRD patterns for a series of Pt_1Co_x/Al_2O_3 catalysts.

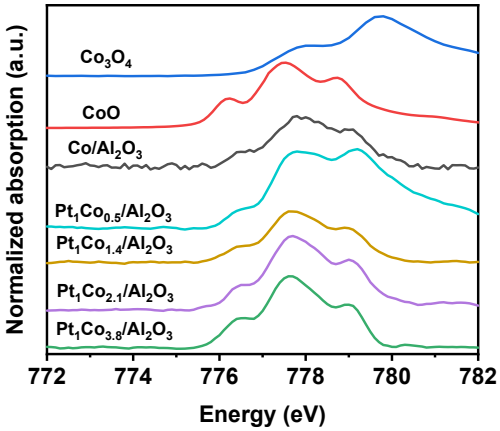

Figure S5. The Co L_3-edgee XAS spectra of Co/Al_2O_3, Pt_1Co_x/Al_2O_3, CoO and Co_3O_4.

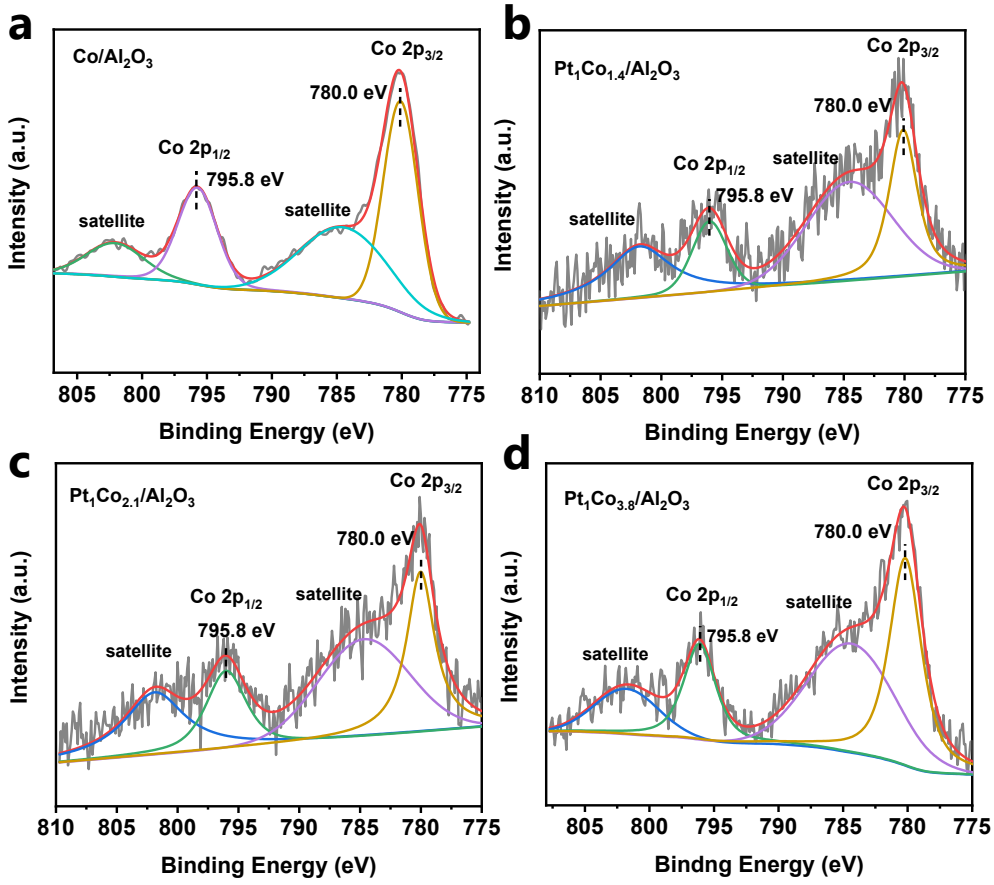

Figure S6. (a-d) The Co 2p XPS spectra of the Co/Al_2O_3 and Pt_1Co_x/Al_2O_3 catalysts. No Co signal was detected for $Pt_1Co_{0.5}/Al_2O_3$ due to the low Co loading.

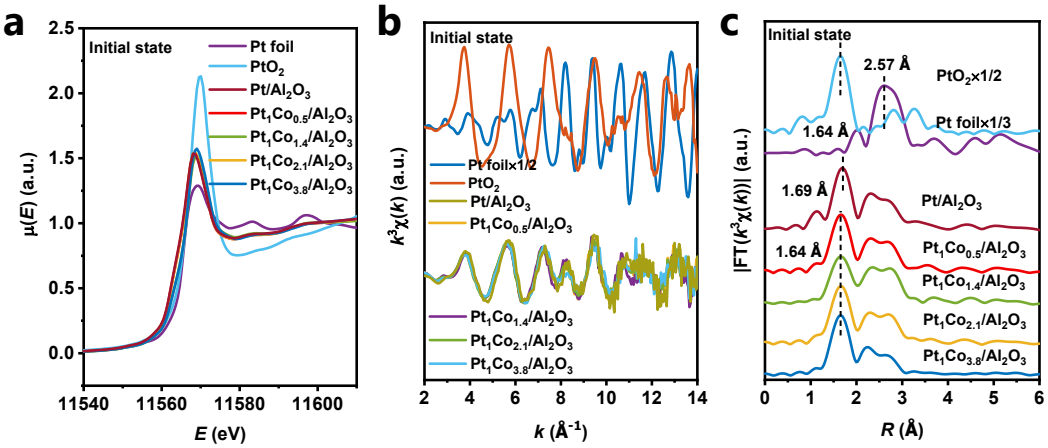

Figure S7. XAFS spectra at the Pt L_3-edge for the Pt/Al_2O_3 and Pt_1Co_x/Al_2O_3 catalysts. (a) Normalized XANES spectra; (b) the k^3-weighted χ(k) functions; (c) the Fourier-transformed (FT) curves of the k^3-weighted χ(k) functions. For reference, the spectra of Pt foil and PtO_2 are also shown.

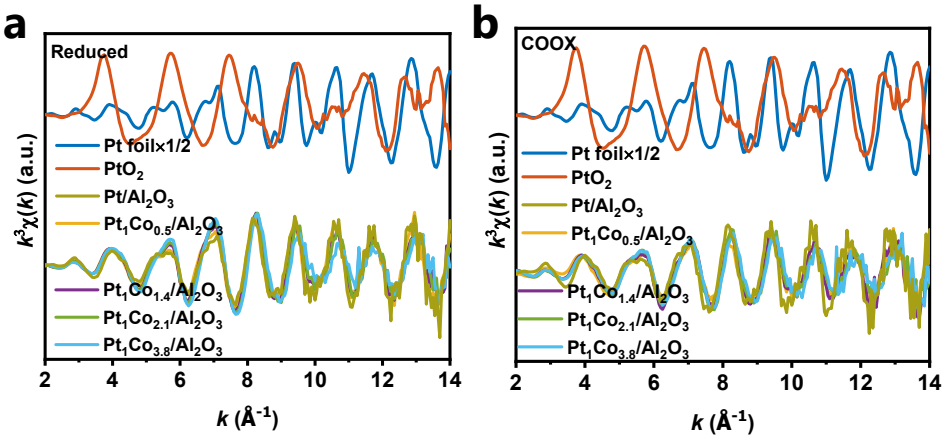

Figure S8. The k^3-weighted χ(k) functions for (a) reduced samples and (b) the samples in COOX. For reference, the spectra of Pt foil and PtO_2 are also shown.

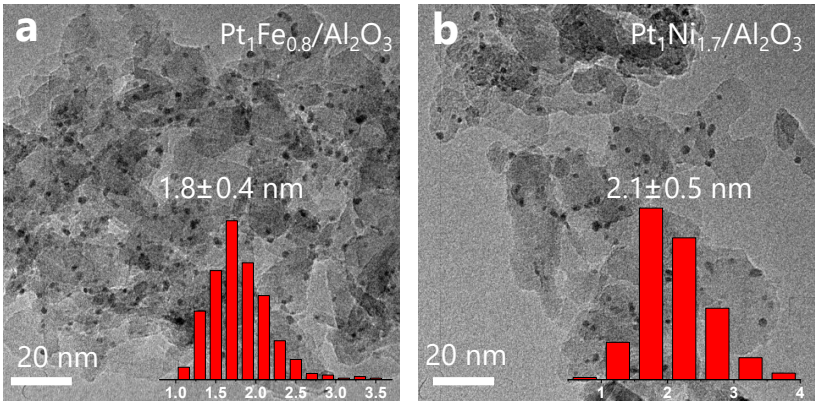

Figure S9. TEM images of the (a) $Pt_1Fe_{0.8}/Al_2O_3$ and (b) $Pt_1Ni_{1.7}/Al_2O_3$.

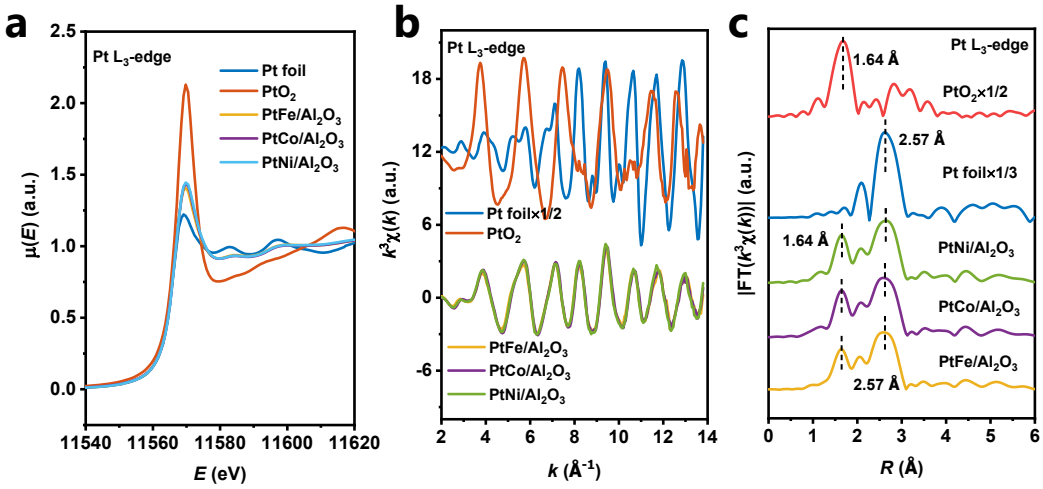

Figure S10. Ex-situ XAFS spectra at the Pt L_3-edge for the $Pt_1Fe_{0.8}/Al_2O_3$, $Pt_1Co_{2.1}/Al_2O_3$ and $Pt_1Ni_{1.7}/Al_2O_3$ catalysts. (a) Normalized XANES spectra; (b) the k^3-weighted χ(k) functions; (c) the Fourier-transformed (FT) curves of the k^3-weighted χ(k) functions. For reference, the spectra of Pt foil and PtO_2 are also shown.

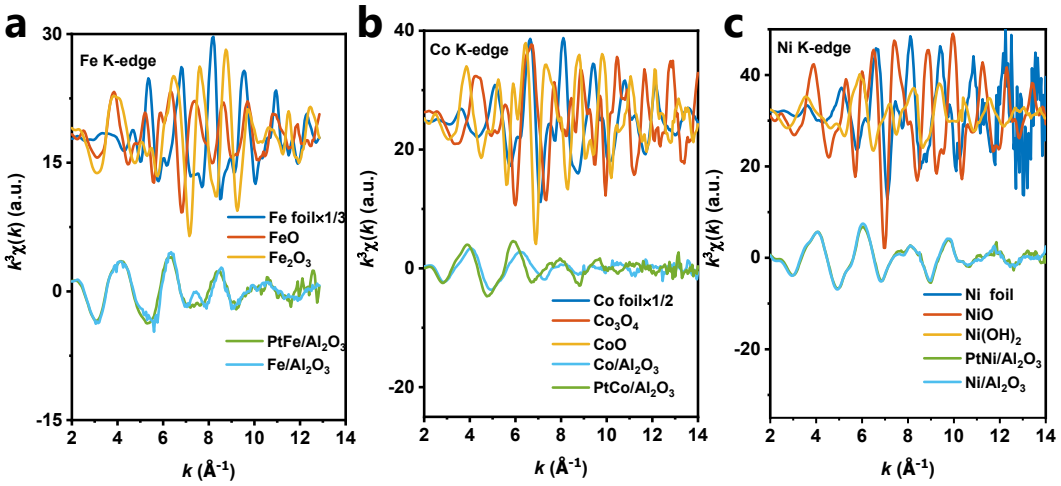

Figure S11. The k^3-weighted χ(k) functions of the $Pt_1Fe_{0.8}/Al_2O_3$, $Pt_1Co_{2.1}/Al_2O_3$ and $Pt_1Ni_{1.7}/Al_2O_3$ catalysts.

Table S1. The actual loadings and ratios of Pt and Co on various samples analysis by ICP-AES.

Sample	Pt loading (wt%)	Co loading (wt%)	Nominal Pt:Co	Actual Pt:Co
Pt/Al_2O_3	1.47	--	--	--
Co/Al_2O_3	--	4.55	--	--
$Pt_1Co_{0.5}/Al_2O_3$	2.32	0.37	1:1	1:0.53
$Pt_1Co_{1.4}/Al_2O_3$	2.77	1.17	1:2	1:1.42
$Pt_1Co_{2.1}/Al_2O_3$	2.67	1.70	1:3	1:2.14
$Pt_1Co_{3.8}/Al_2O_3$	2.52	2.85	1:6	1:3.80
$Pt_1Fe_{0.8}/Al_2O_3$	3.79	0.9	1:3	1:0.83
$Pt_1Ni_{1.7}/Al_2O_3$	3.58	1.9	1:3	1:1.73

Table S2. Structure parameters of a series of Pt_1Co_x/Al_2O_3 and Pt/Al_2O_3 after reduction extracted from quantitative curve-fittings of the Pt L_3-edge EXAFS data.

Sample	**Coordination**	***N***	***R* (Å)**	**σ^2 (10^{-3}Å^2)**	**ΔE_0 (eV)**
Pt foil	Pt−Pt	12	2.76	-	-
Pt/Al_2O_3 (reduced)	Pt−Pt	8.9±0.8	2.75±0.02	7.0±0.4	7.7±1.1
$Pt_1Co_{0.5}/Al_2O_3$ (reduced)	Pt−Co	0.5±0.3	2.63±0.03	7.4±1	4.9±1.0
	Pt−Pt	9.1±1.7	2.74±0.01	7.4±1	4.9±1.0
$Pt_1Co_{1.4}/Al_2O_3$ (reduced)	Pt−Co	1.6±0.2	2.63±0.01	7.5±1	5.5±1.3
	Pt−Pt	8.1±1.4	2.74±0.01	7.5±1	5.5±1.3
$Pt_1Co_{2.1}/Al_2O_3$ (reduced)	Pt−Co	2.0±0.3	2.63±0.01	7.8±1	6.6±1.3
	Pt−Pt	8.4±1.6	2.74±0.01	7.8±1	6.6±1.3
$Pt_1Co_{3.8}/Al_2O_3$ (reduced)	Pt−Co	2.9±0.2	2.61±0.01	8.1±1	5.4±1.0
	Pt−Pt	7.0±0.9	2.73±0.01	8.1±1	5.4±1.0