Supporting Information

Solvent-Mediated Length Tuning of Ultrathin Platinum-Cobalt Nanowires for Efficient Electrocatalysis

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Hui Xu and Jingjing Wei contributed equally to this work

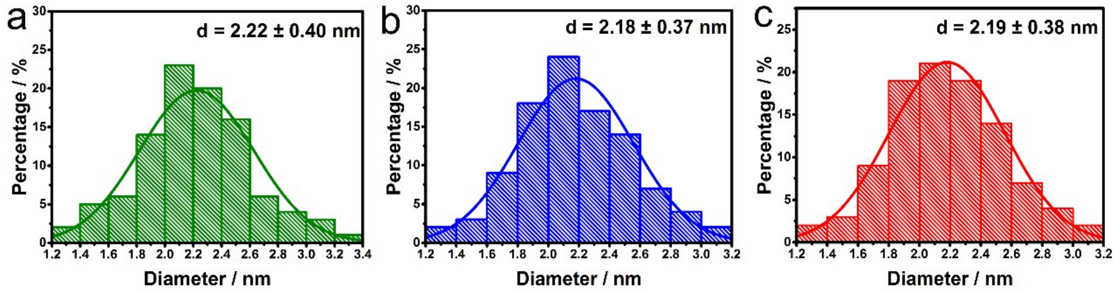

Figure S1. Diameter distributions of (a) Pt_3Co_1 UNWs-S, (b) Pt_3Co_1 UNWs-M, and (c) Pt_3Co_1 UNWs-L.

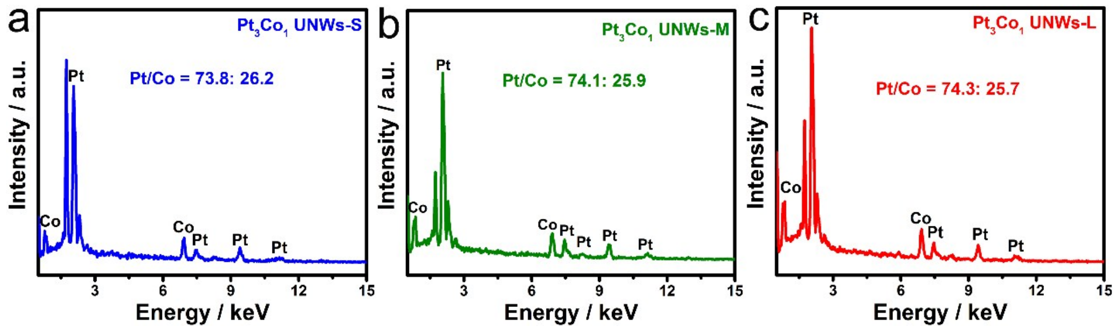

Figure S2. EDX patterns of (a) Pt_3Co_1 UNWs-S, (b) Pt_3Co_1 UNWs-M, and (c) Pt_3Co_1 UNWs-L.

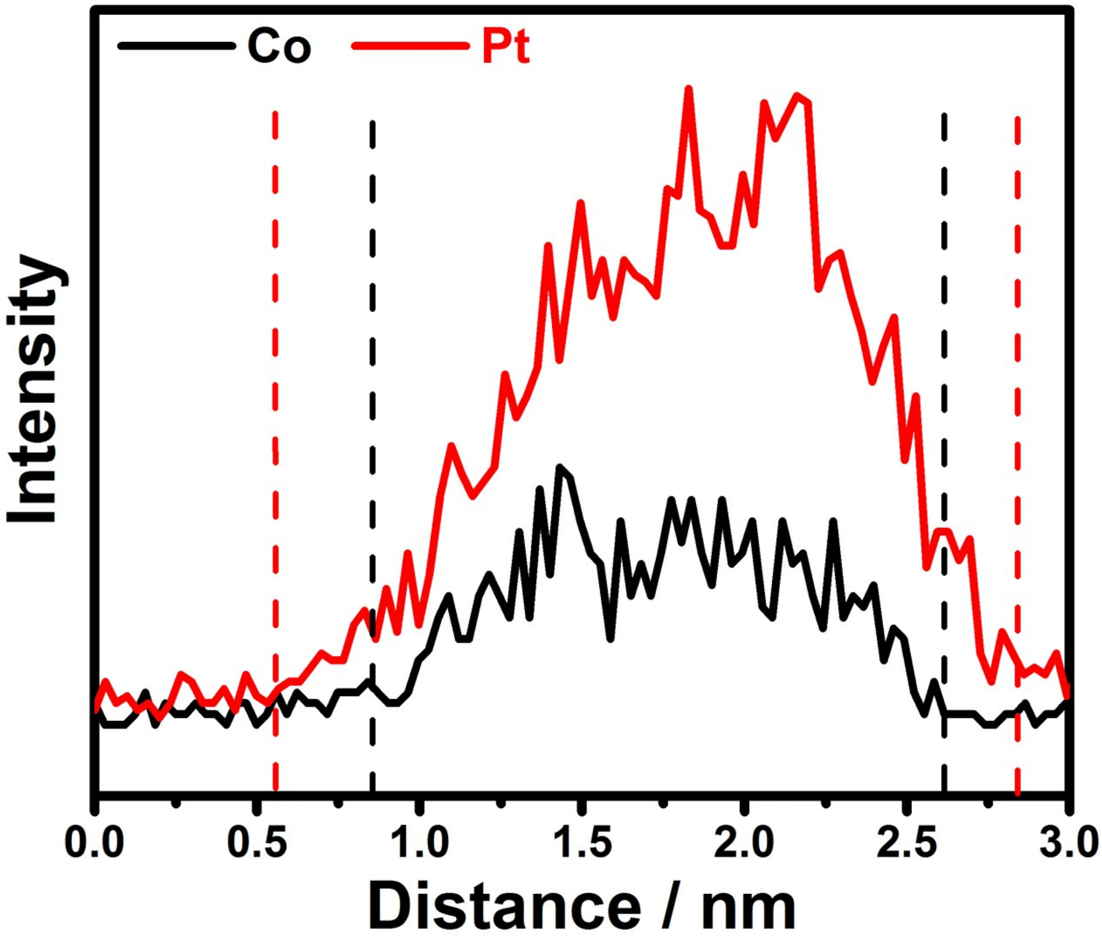

Figure S3. EDS line-scanning profile of Pt_3Co_1 UNWs-L.

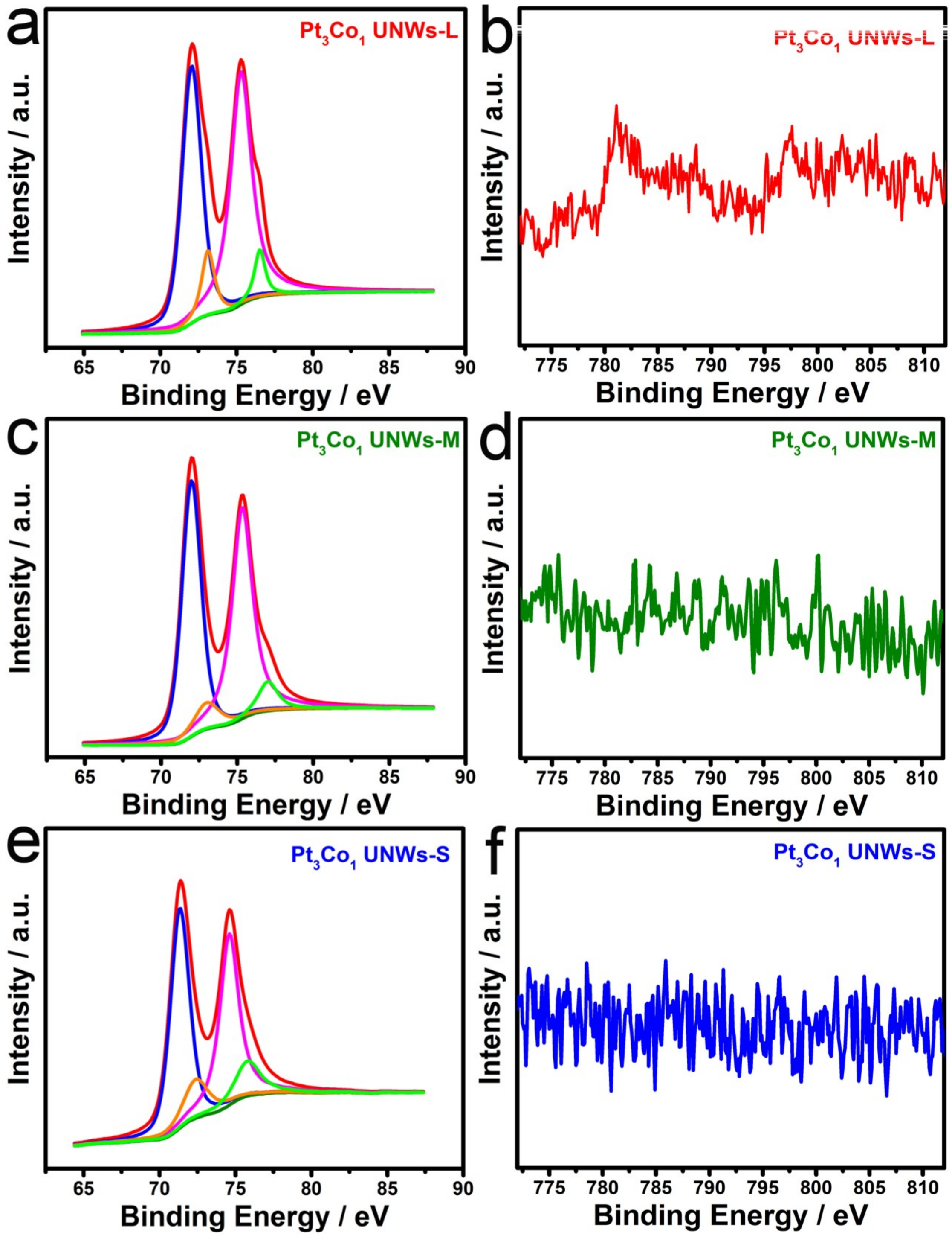

Figure S4. High-resolution XPS spectra of Pt 4f and Co 2p of (a and b) Pt_3Co_1 NWs-L, (c and d) Pt_3Co_1 NWs-M, and (e and f) Pt_3Co_1 NWs-S.

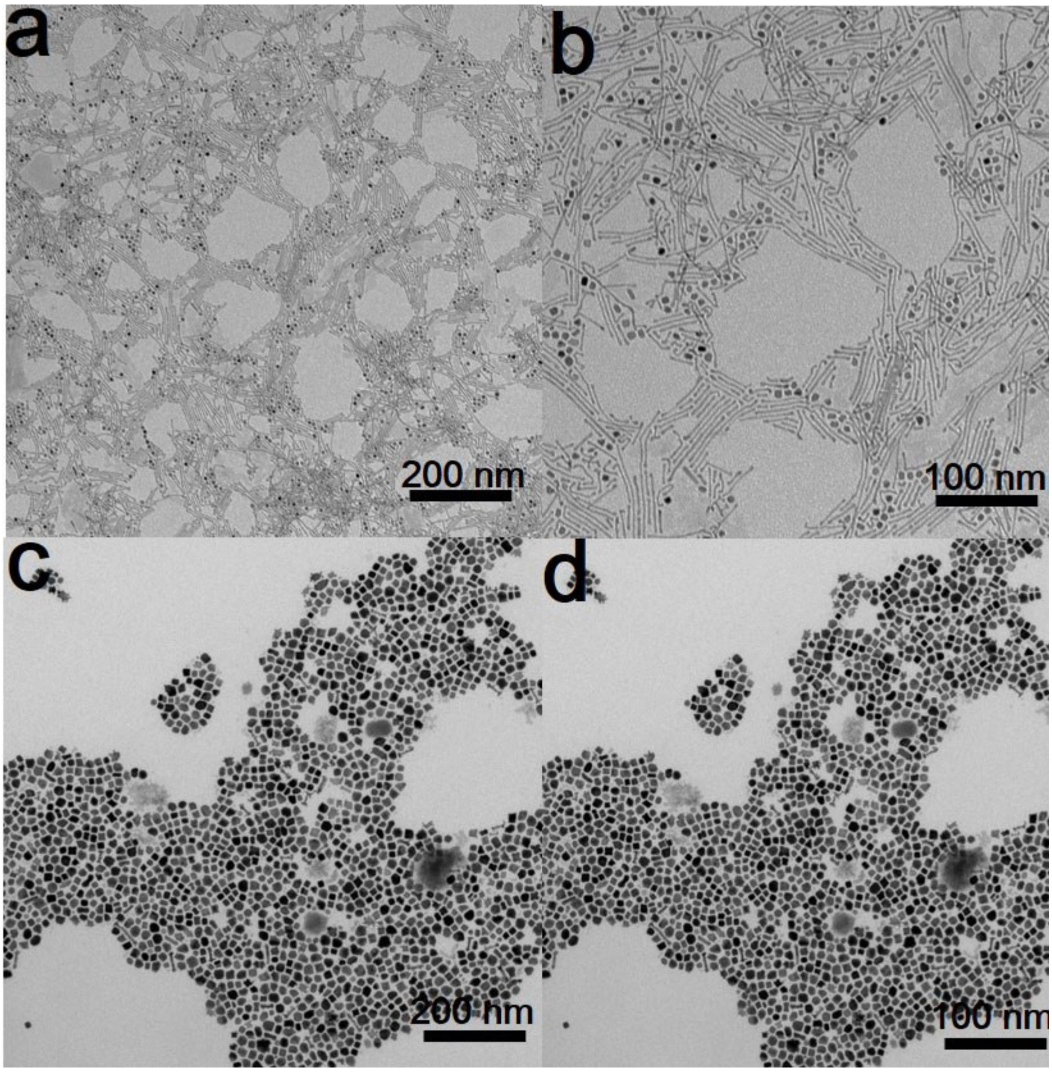

Figure S5. Representative TEM images of Pt_3Co_1 UNWs prepared in the same conditions as Pt_3Co_1 UNWs-L while replacing the (a and b) $Mo(CO)_6$ with $W(CO)_6$ or replacing glucose with (c and d) citric acid.

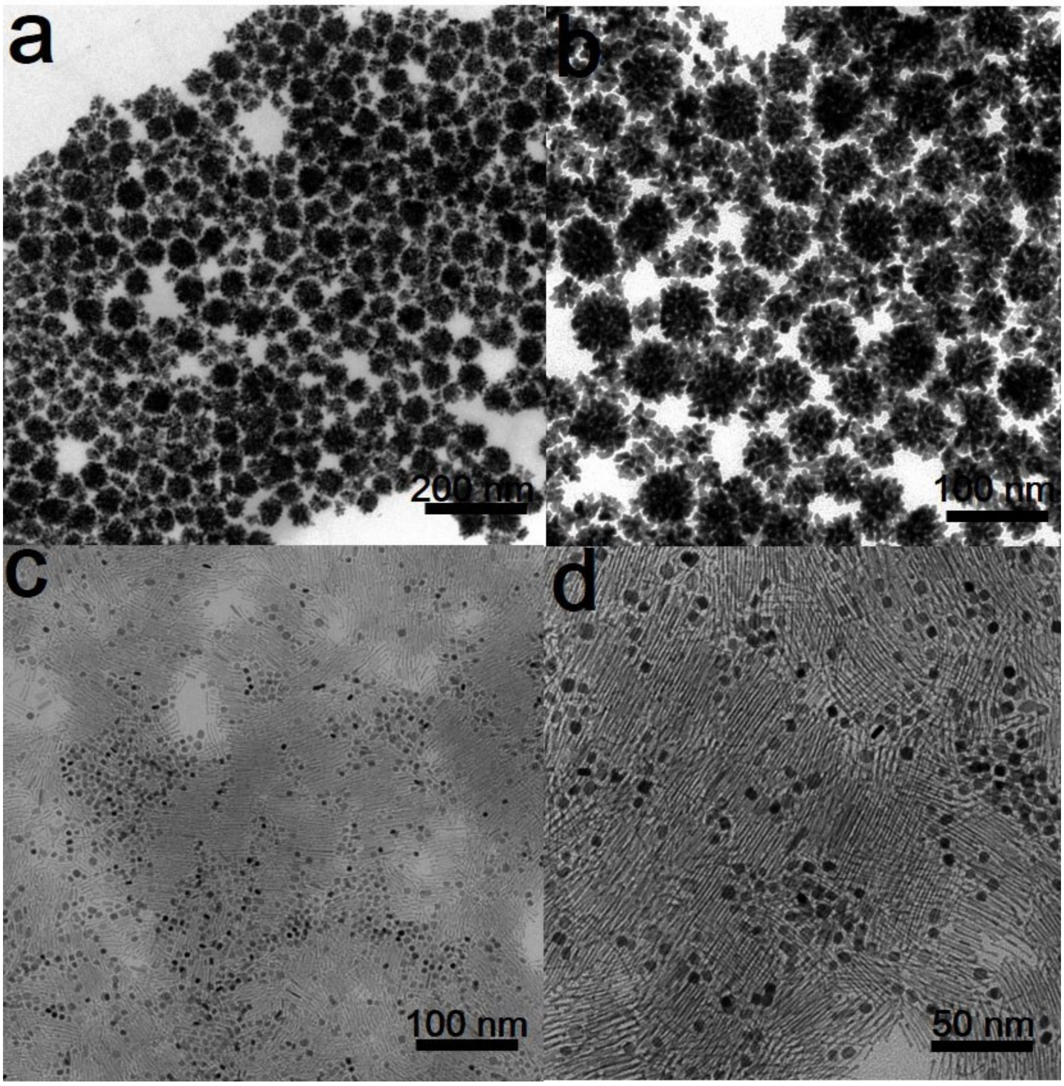

Figure S6. Representative TEM images of Pt_3Co_1 UNWs prepared in the same conditions as Pt_3Co_1 UNWs-L in the absence of $Mo(CO)_6$ with $W(CO)_6$ or replacing CTAC with (c and d) CTAB.

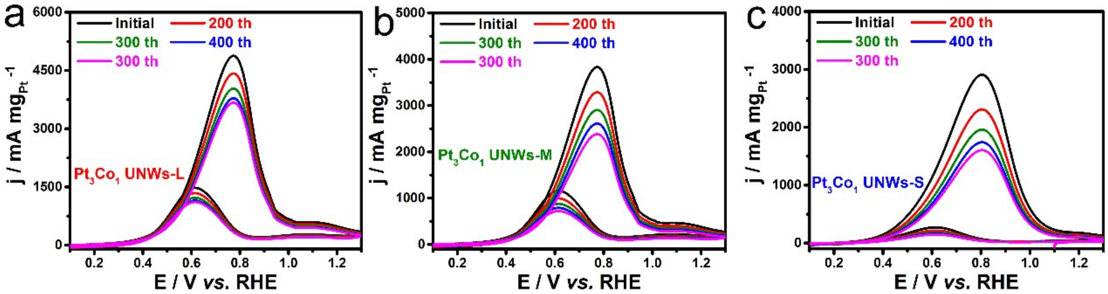

Figure S7. CV curves of Pt_3Co_1 UNWs-S, Pt_3Co_1 UNWs-M, and Pt_3Co_1 UNWs-L at different scan rates in 1.0 M KOH and 1.0 M EG solution.

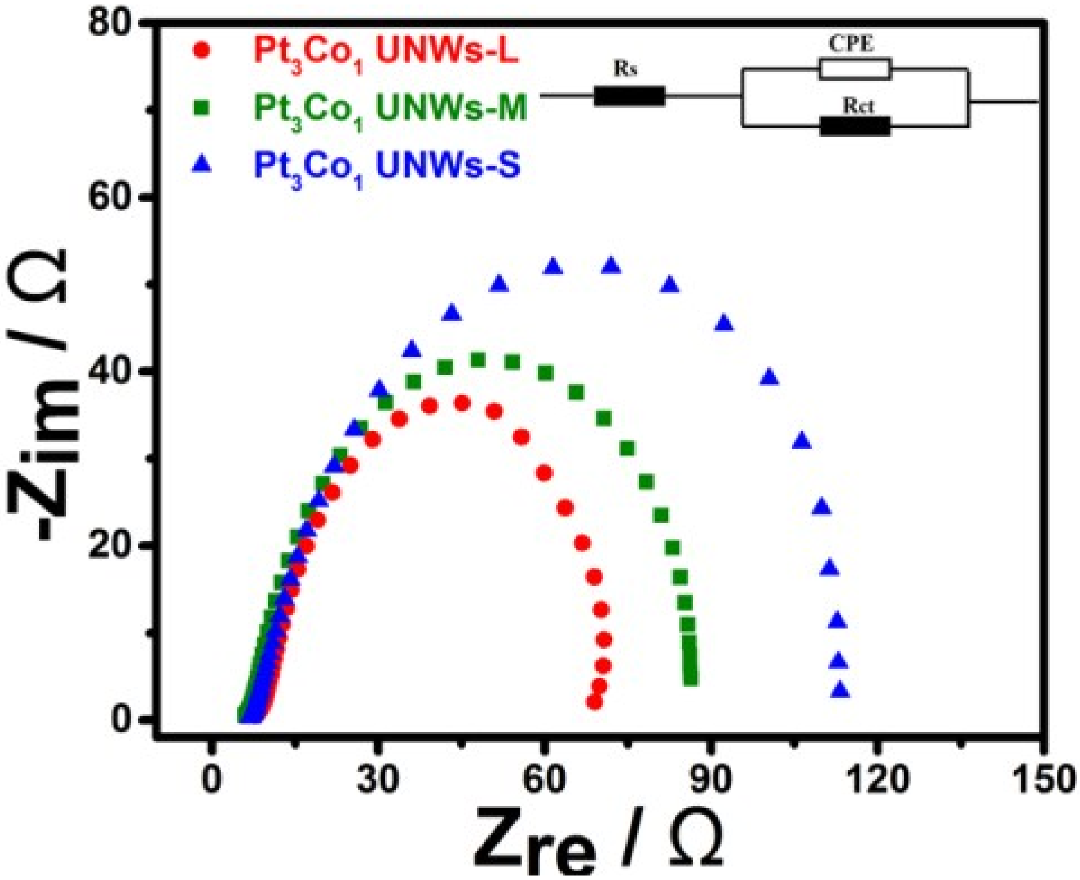

Figure S8. Nyquist plots of Pt_3Co_1 UNWs-S, Pt_3Co_1 UNWs-M, and Pt_3Co_1 UNWs-L in 1.0 M KOH and 1.0 M glycerol solution at 0.8 V.

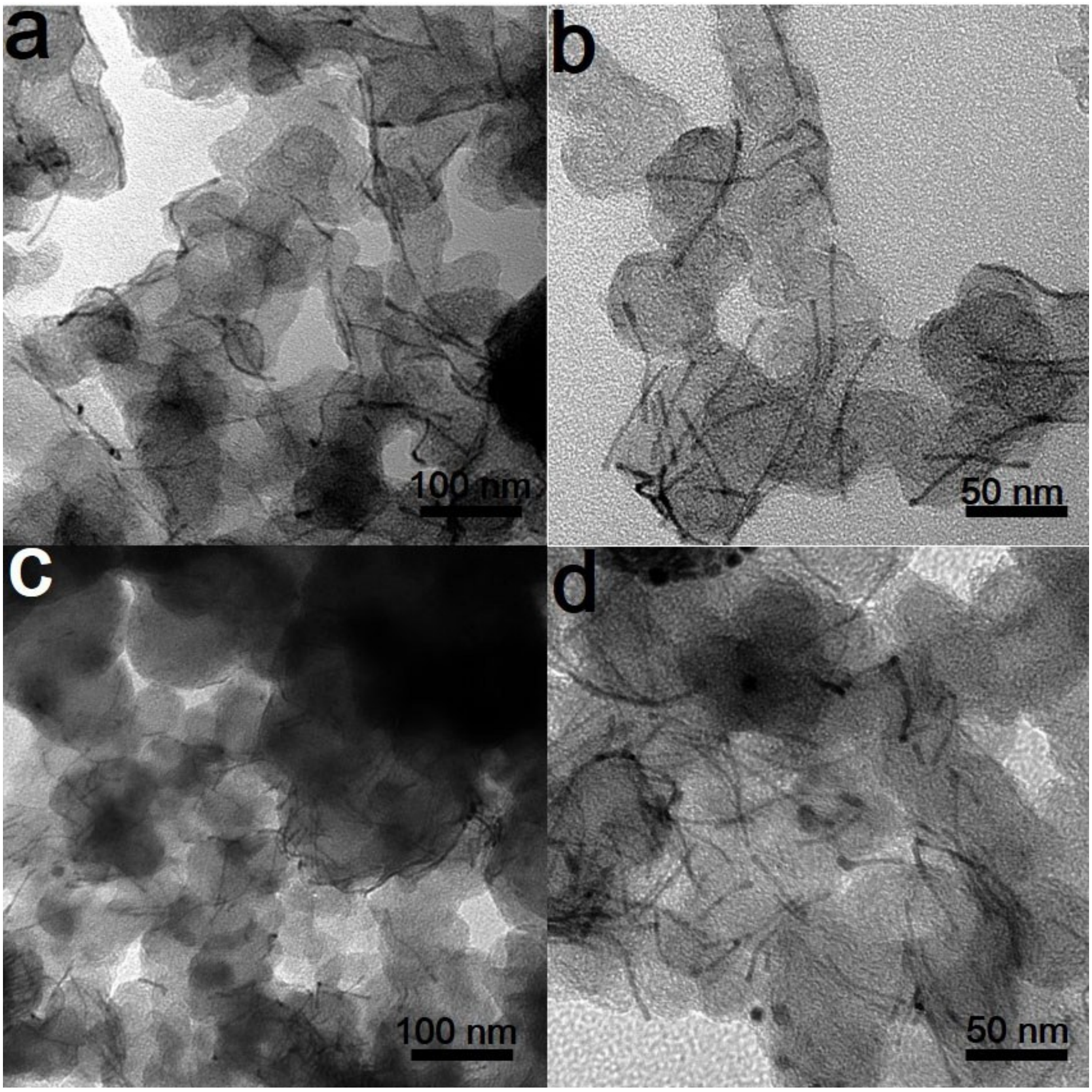

Figure S9. Representative TEM images of Pt_3Co_1 UNWs-L (a and b) before and (c and d) after long-term electrochemical measurements.

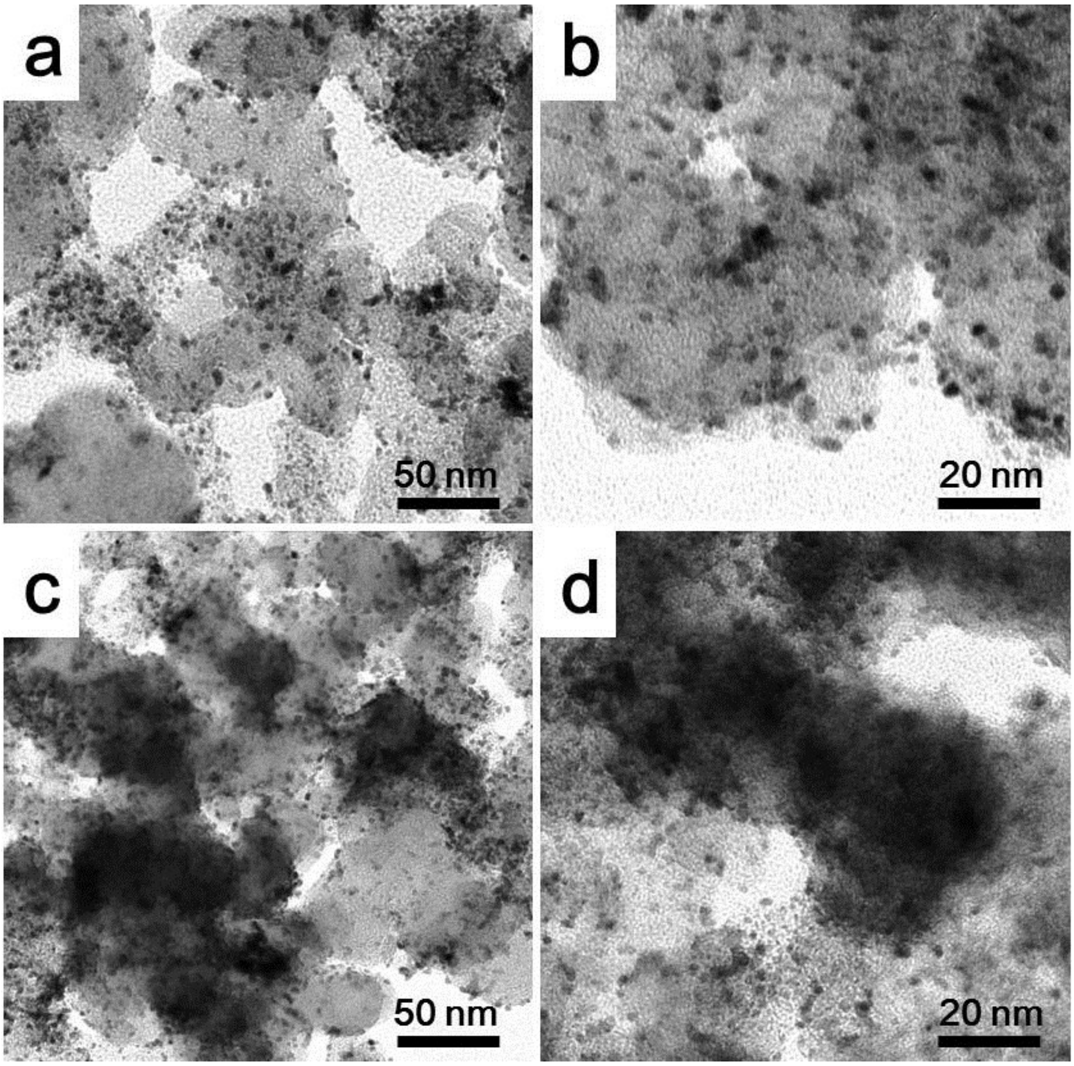

Figure S10. Representative TEM images of commercial Pt/C catalysts (a and b) before and (c and d) after long-term electrochemical measurements.

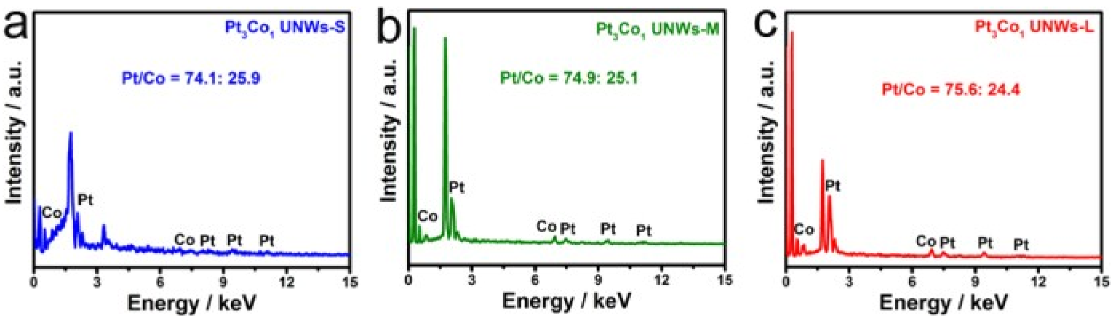

Figure S11. EDX patterns of (a) Pt_3Co_1 UNWs-S, (b) Pt_3Co_1 UNWs-M, and (c) Pt_3Co_1 UNWs-L after catalytic cycles.

Table S1 EGOR performances of Pt_3Co_1 UNWs-L and various electrocatalysts from published works.

Catalysts	Peaks currents from CV curves		Electrolyte	References
	J_m (A/mg)	J_s (mA/cm^2)		
Pt_3Co_1 UNWs-L	4.9	9.4	1.0 M KOH + 1.0 M EG	This work
Pt/Ru/XC72 Catalyst	0.24		0.5 M H_2SO_4 + 0.4M EG	J. Power Sources **2011**, *196*, 1078-1083.
PtPd@Pt Nanocrystals/rGO	0.23		0.5 M H_2SO_4 + 0.5 M EG	Electrochim. Acta **2016**, *18*, 576-583.
$PtNi_{0.67}Pb_{0.26}$ NWs/C	0.42	0.65	0.1 M $HClO_4$ + 0.2 M EG	J. Mater. Chem. A **2017**, *5*, 18977-18983
Pd_1Cu_1 nanosphere	3.58		1.0 M KOH + 1.0 M EG	Electrochim. Acta **2018**, *261*, 521-529.
PdCuBi nanoparticles	0.171		1 M KOH + 0.5 M EG	J. Power Sources. **2014**, *249*, 9-12
PtCu nanocrystals	4.259		1.0 M	Int. J. Hydrogen

			KOH + 1.0 M EG	Energy **2018**, *43*, 1489-1496
PtRu alloy	3.052		1.0 M KOH + 1.0 M EG	Int. J. Hydrogen Energy **2017**, *42*, 20720-20728
PdAg nanoparticle	0.169		0.1 M KOH + 1.0 M EG	Int. J. Hydrogen Energy **2015**, *40*, 2225-2230
PtPd@Pt nanocrystals	1.167		0.5 M KOH + 0.5 M EG	Electrochim. Acta **2016**, *187*, 576-583.

Table S2 A literature survey of the activity and stability of catalysts toward alcohol electrooxidation

Catalysts	Electrolyte	Cycling stability	References
Pt_3Co_1 UNWs-L	1.0 M KOH + 1.0 M EG	75.3 % activity after 500 cycles	This work
Pt_3Co_1 UNWs-L	1.0 M KOH + 1.0 M Glycerol	74.9 % activity after 500 cycles	This work
Pd/C promoted with $CaSiO_3$	1.0 M KOH + 1.0 M EG	60 % activity after 1000 cycles	Electrochim. Acta **2015**, *158*, 18-23
Pd_7Ru_1 nanodendrites	1.0 M KOH + 1.0 M EG	67.7 % activity after 500 cycles	Nanoscale **2015**, *7*, 12445-12451
$PdCu_2$	1.0 M KOH + 1 M ethanol	70 % activity after 300 cycles	ACS Appl. Mater. Interfaces **2016**, *8*, 34497
PdNi	1.0 M KOH + 1 M ethanol	60 % activity after 500 cycles	J. Colloid Interface Sci. **2017**, *493*, 190-197
PtRu Nanoparticles/XC	0.5 M H_2SO_4 + 0.5 M glycerol	52 % activity after 500 cycles	Electrochim. Acta **2014**, *142*, 223-227
$PtPb_{0.27}$ NPs/C	0.1 M $HClO_4$+ 0.2 M ethanol	31.6 % activity after 1000 cycles	Chem. Mater. **2016**, *28*, 4447-4452.
$Pt_{0.3}Ru_{0.6}Pd_{0.1}$	1 M KOH + 1	48 % activity after	New J. Chem. **2017**, *41*,

	M methanol	500 cycles	3048-3054
PtAu/RGO/GC	1 M KOH + 1 M methanol	69.8 % activity after 1000 cycles	J. Mater. Chem. A **2013**, *1*, 7255-7261
THH PtNi NFs	0.5 M $HClO_4$+ 0.2 M ethanol	30 % activity after 300 cycles	Nano Lett. **2016**, *16*, 2762-2767

Table S3 GOR performances of Pt_3Co_1 UNWs-L and various electroatalysts from published works.

Catalysts	Peaks currents from CV curves		Electrolyte	References
	J_m (A/mg)	J_s (mA/cm^2)		
Pt_3Co_1 UNWs-L	3.7	7.2	1.0 M KOH + 1.0 M Glycerol	This work
$PtNi_{0.67}Pb_{0.26}$ NWs/C	0.36	0.61	0.1 M $HClO_4$ + 0.2 M Glycerol	J. Mater. Chem. A **2017**, **5**, 18977-18983
Pt Nanoparticles		~ 0.23	0.1 M H_2SO_4 + 0.255 M Glycerol	Electrochim. Acta **2013**, 98, 25-31.
Pt NOs		~ 0.35	0.1 M H_2SO_4 + 0.1 M Glycerol	Electrocatal. **2011**, 2, 96-105.
Pt/MWCNT		0.16	0.1 M $HClO_4$ + 1.0 M Glycerol	Electrochim. Acta **2012**, 66, 180-187.
PtNi/C	0.204	0.27	0.5 M KOH + 2.0 M Glycerol	Appl. Catal. A **2012**, 429-430, 39-47
Pd-CNx/G	1.1		0.5 M KOH + 0.5 M Glycerol	ACS Catal. **2015**, 5, 3174-3180

Pd_5Ru-PEDOT/C		4.3	1 M KOH + 0.5 M Glycerol	Electrochim. Acta **2015**, *180*, 339-352
$Pd_{50}Ni_{50}/C$	0.190		0.1 M KOH + 0.1 M Glycerol	Electrocatal. **2013**, 4, 167-178
Pd_3Sn/phen-C	0.175		0.1 M KOH + 0.5 M Glycerol	Int. J. Hydrogen Energy **2016**, *41*, 1272-14280
Pd-NiO_x-P/C	0.364		0.1 M KOH + 0.5 M Glycerol	Chem. Eng. J. **2017**, 38, 419-427
PtAg nanotubes	0.208	6.0	0.5 M KOH + 0.5 M Glycerol	Electrochem. Commun. **2014**,46,36-39

Table S4 The parameters of R_{ct} from equivalent circuits for different catalysts in different solutions

Catalysts	1 M KOH + 1 M EG (Ω cm^2)	1 M KOH + 1 M glycerol (Ω cm^2)
Pt_3Co_1 UNWs-S	108	189
Pt_3Co_1 UNWs-M	84	154
Pt_3Co_1 UNWs-L	76	131