

Supporting materials for:

**Ternary PtFeCo Alloys on Graphene with Highly Electrocatalytic
Activities for Methanol Oxidation**

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Table S1. The inductively coupled plasma atomic emission spectroscopy (ICP-AES) results for all samples.

Samples	Mass% (Pt, ICP- AES)	Elements	Atom% (feeding ratio)	Atom% (ICP-AES)
Pt₃₀Fe₃₇Co₃₃@G-7%	6.85%	Pt:Fe:Co	32:34:34	30:37:33
Pt₅₂Fe₂₉Co₁₉@G-7%	6.93%	Pt:Fe:Co	50:25:25	52:29:19
Pt₆₄Fe₂₀Co₁₆@G-7%	7.09%	Pt:Fe:Co	70:15:15	64:20:16
Pt₅₈Fe₄₂@G-7%	6.87%	Pt:Fe	50:50	58:42
Pt₅₂Co₄₈@G-7%	6.72%	Pt:Co	50:50	52:48
Pt₄₈Fe₂₅Co₂₇@G- 10%	9.88%	Pt:Fe:Co	50:25:25	48:25:27
Pt₅₁Fe₂₇Co₂₂@G-4%	4.11%	Pt:Fe:Co	50:25:25	51:27:22
Pt₅₀Fe₂₈Co₂₂@G-1%	1.03%	Pt:Fe:Co	50:25:25	50:28:22

Table S2. XRD values of all PtFeCo@G-7% samples.

Samples	2θ/degree	Experimental	Theoretical	d₍₁₁₁₎	Strain
	e	lattice	lattice	spacing	(%)
	(111)	parameter	parameter	(nm)	
		(Å)	(Å)		
Pt (JCPDS No. 04-0802)	39.76	3.923		0.2265	
Pt₃₀Fe₃₇Co₃₃@G-7%	41.10	3.795	3.407	0.2191	3.27
Pt₅₂Fe₂₉Co₁₉@G-7%	40.66	3.838	3.545	0.2216	2.16
Pt₆₄Fe₂₀Co₁₆@G-7%	40.48	3.862	3.651	0.2230	1.55

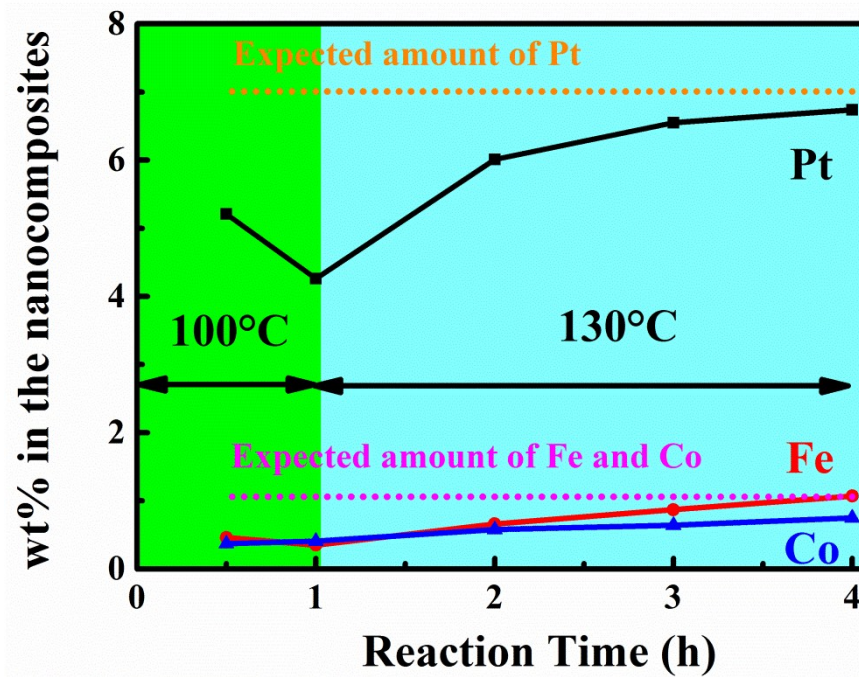


Figure S1. the elemental weight composition of $\text{Pt}_{52}\text{Fe}_{29}\text{Co}_{19}@G-7\%$ as a function of the reaction time.

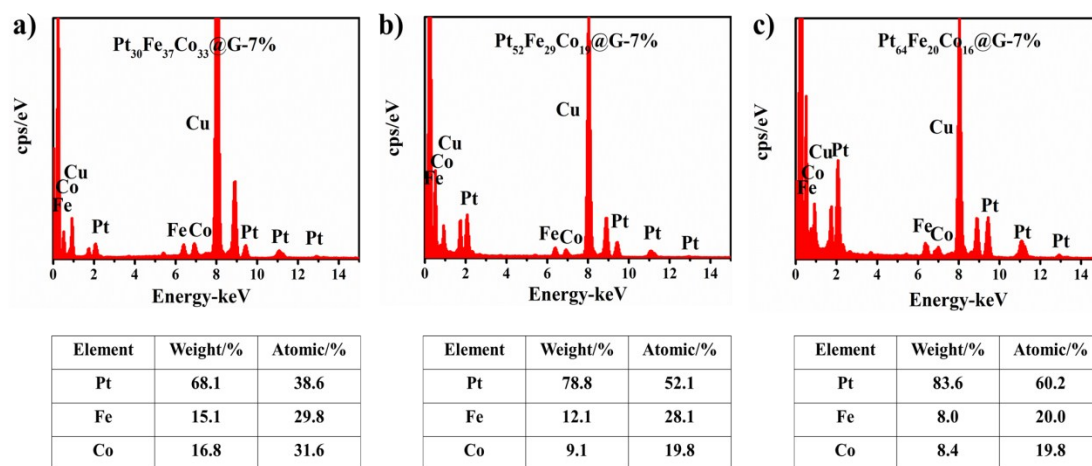


Figure S2. EDX-area analyses of (a) $Pt_{30}Fe_{37}Co_{33}@G-7\%$, (b) $Pt_{52}Fe_{29}Co_{19}@G-7\%$, and (c) $Pt_{64}Fe_{20}Co_{16}@G-7\%$ nanocomposites.

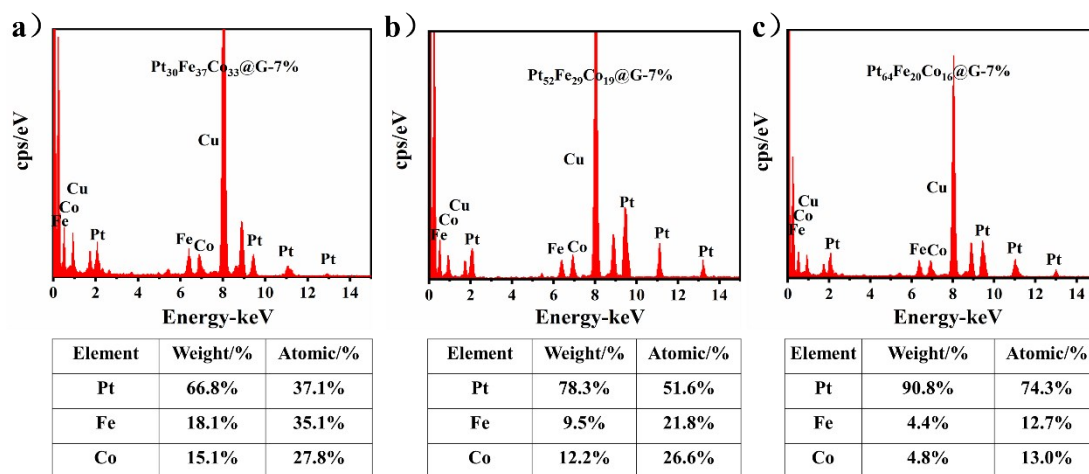


Figure S3. EDX-particle analyses of (a) $\text{Pt}_{30}\text{Fe}_{37}\text{Co}_{33}@G-7\%$, (b) $\text{Pt}_{52}\text{Fe}_{29}\text{Co}_{19}@G-7\%$, and (c) $\text{Pt}_{64}\text{Fe}_{20}\text{Co}_{16}@G-7\%$ nanocomposites.

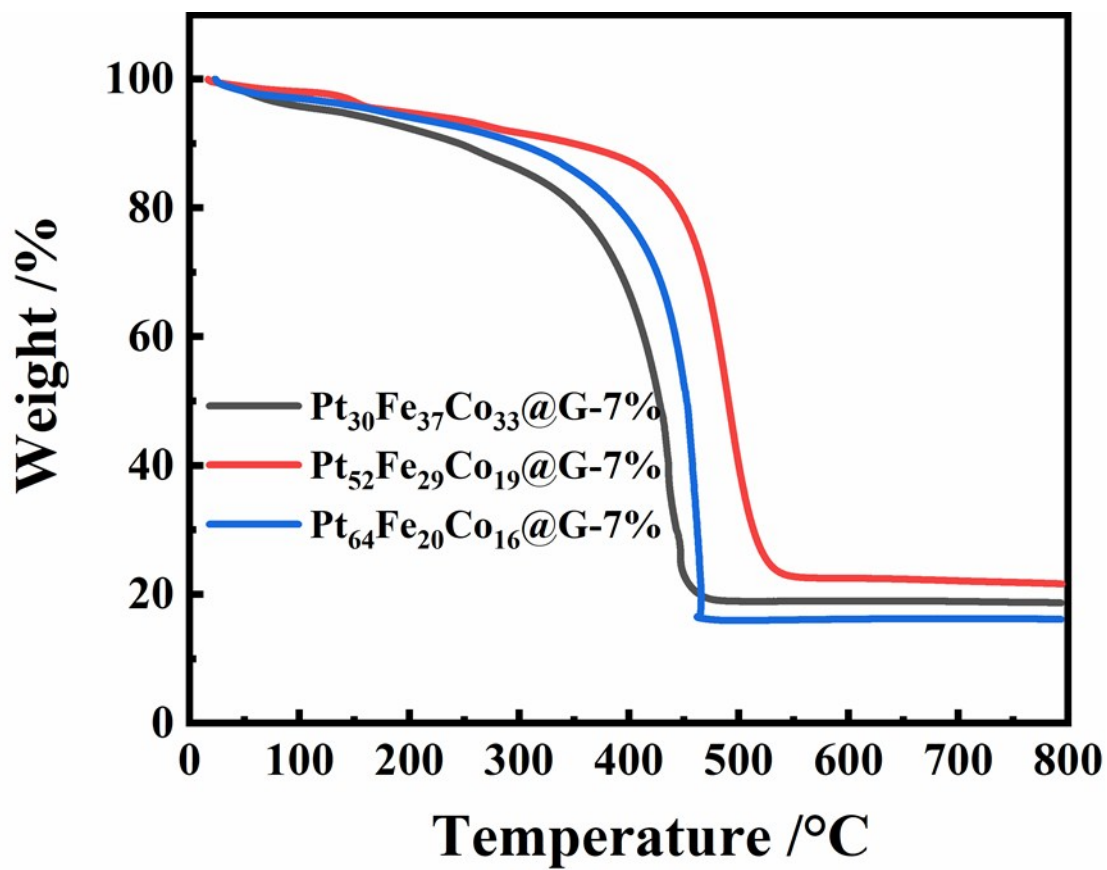


Figure S4. TGA curves of Pt₃₀Fe₃₇Co₃₃@G-7%, Pt₅₂Fe₂₉Co₁₉@G-7%, and Pt₆₄Fe₂₀Co₁₆@G-7% nanocomposites.

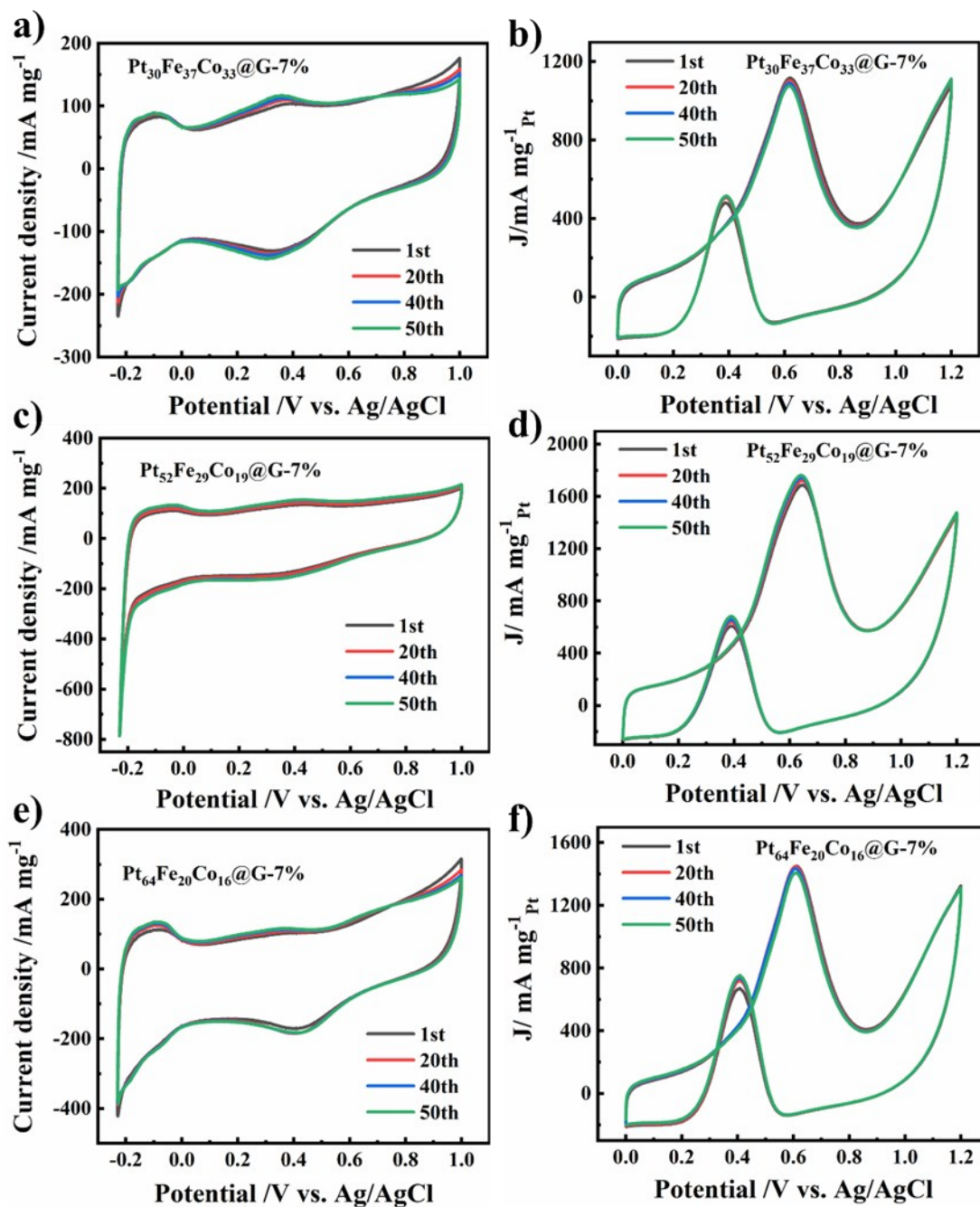


Figure S5. CV curves of (a) Pt₃₀Fe₃₇Co₃₃@G-7%, (c) Pt₅₂Fe₂₉Co₁₉@G-7%, (e) Pt₆₄Fe₂₀Co₁₆@G-7% electrodes in 0.5 M H₂SO₄ at 50 mV s⁻¹ from the 1st circle to the 50th circle; CV curves of (b) Pt₃₀Fe₃₇Co₃₃@G-7%, (d) Pt₅₂Fe₂₉Co₁₉@G-7%, (f) Pt₆₄Fe₂₀Co₁₆@G-7% electrodes in 0.5 M H₂SO₄ + 0.5 M CH₃OH at 50 mV s⁻¹ from the 1st circle to the 50th circle.

Table S3. The onset potentials and peak potentials of CO oxidation for Pt₃₀Fe₃₇Co₃₃@G-7%, Pt₅₂Fe₂₉Co₁₉@G-7%, Pt₆₄Fe₂₀Co₁₆@G-7% and Pt/C

	onset potential of CO oxidation (V)	peak potential of CO oxidation (V)
Pt ₃₀ Fe ₃₇ Co ₃₃ @G- 7%	0.44	0.57
Pt ₅₂ Fe ₂₉ Co ₁₉ @G- 7%	0.40	0.56
Pt ₆₄ Fe ₂₀ Co ₁₆ @G- 7%	0.45	0.60
Pt/C	0.50	0.66

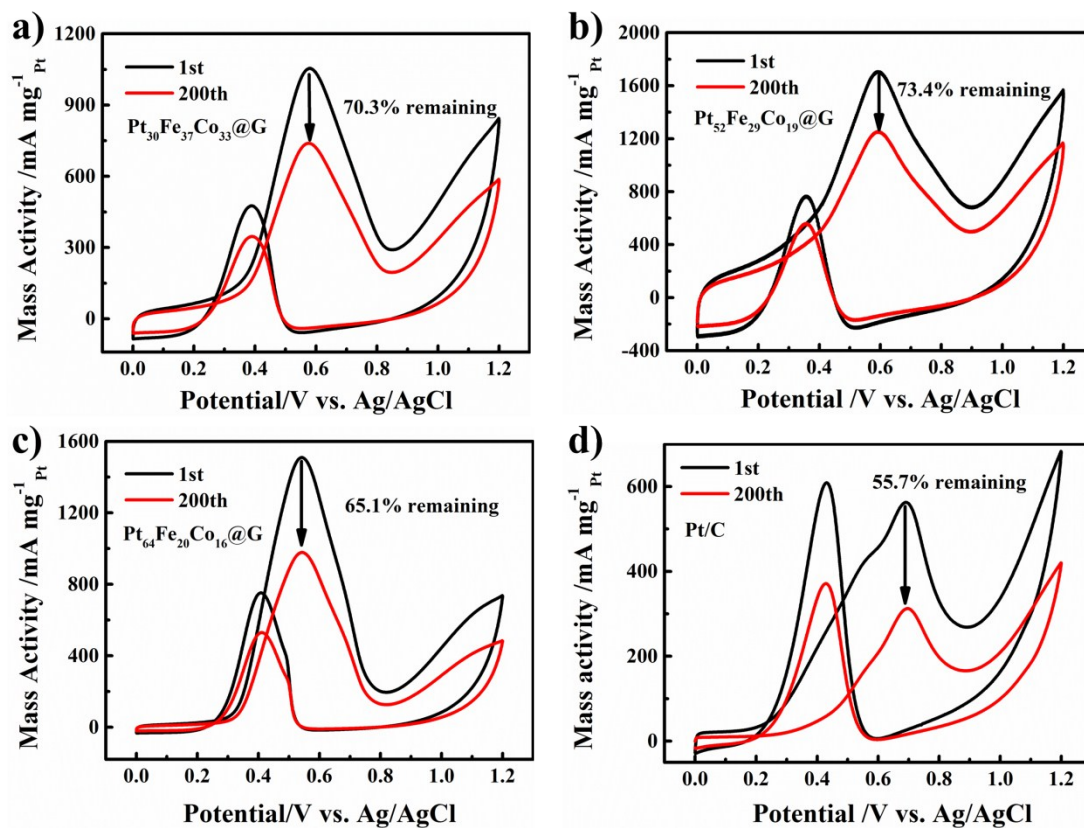


Figure S6. CV curves recorded at a sweep rate of 50 mV s^{-1} in $0.5 \text{ M H}_2\text{SO}_4$ and $0.5 \text{ M CH}_3\text{OH}$ aqueous solution for the 1st and 200th cycles.

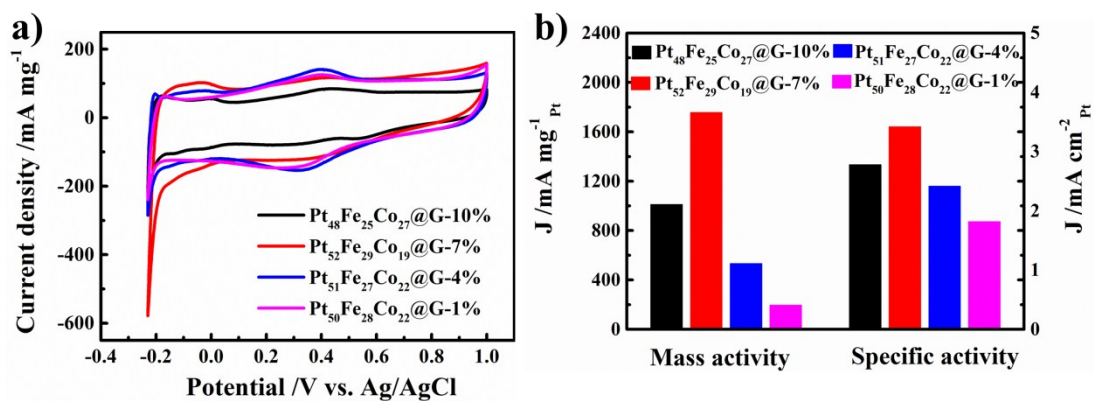


Figure S7. (a) CV curves of Pt₄₈Fe₂₅Co₂₇@G-10%, Pt₅₂Fe₂₉Co₁₉@G-7%, Pt₅₁Fe₂₇Co₂₂@G-4% and Pt₅₀Fe₂₈Co₂₂@G-1% electrodes in 0.5 M H₂SO₄ at a scan rate of 50 mV s⁻¹; (b) Bar graph illuminating the mass activities (left) and specific activities (right) at anodic peak potential.