Supporting Information

In-suit Growth of Ultrathin *Fcc*-NiPt Nanocrystals on Graphene for Methanol and Formic Acid Oxidation

Liu Lin [a], Mengwei Yuan [a], Zemin Sun [a], Huifeng Li [a], Caiyun Nan [a], Genban Sun [a,b,], and Shulan Ma [a]*

[a]Beijing Key Laboratory of Energy Conversion and Storage Materials and College of Chemistry, Beijing Normal University, Beijing 100875, China

[b]Department of Materials Physics and Chemistry, University of Science and Technology Beijing, Beijing 100083, China

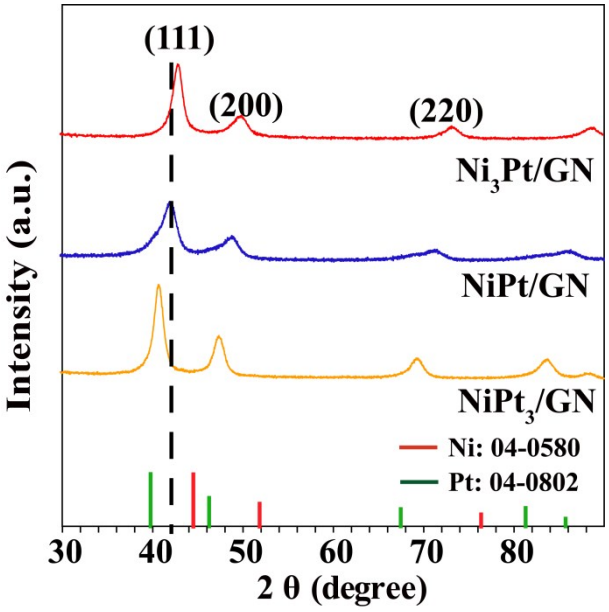

Fig. S1 XRD patterns of NiPt/GN, Ni_3Pt/GN and $NiPt_3$/GN nanocomposites.

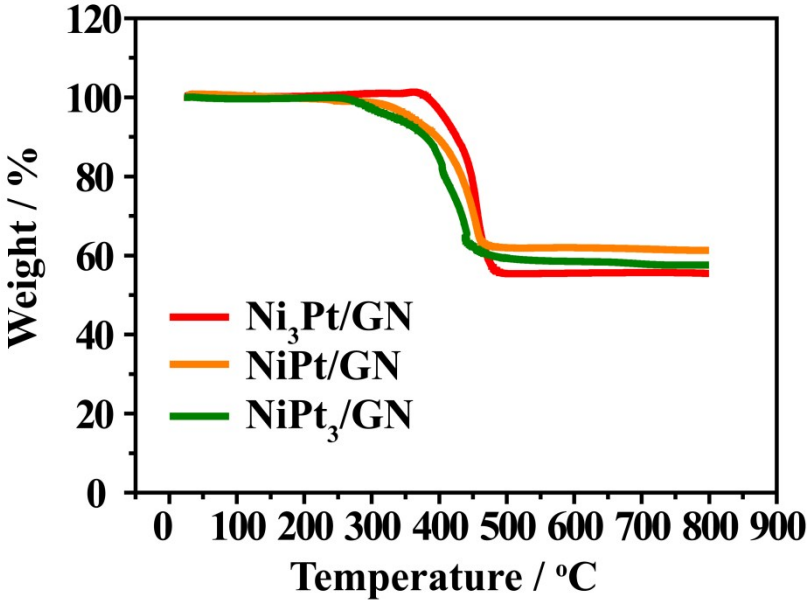

Fig. S2 TGA curves of NiPt/GN, Ni_3Pt/GN and $NiPt_3$/GN nanocomposites.

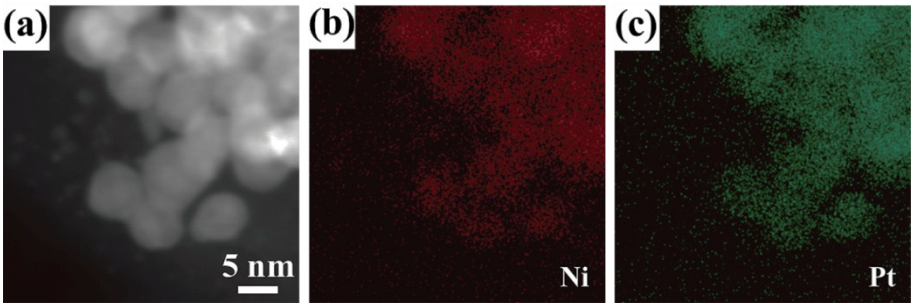

Fig. S3 (a) HAADF-STEM image and (b–c) EDS mapping of Pt and Ni elements of NiPt nanoparticles.

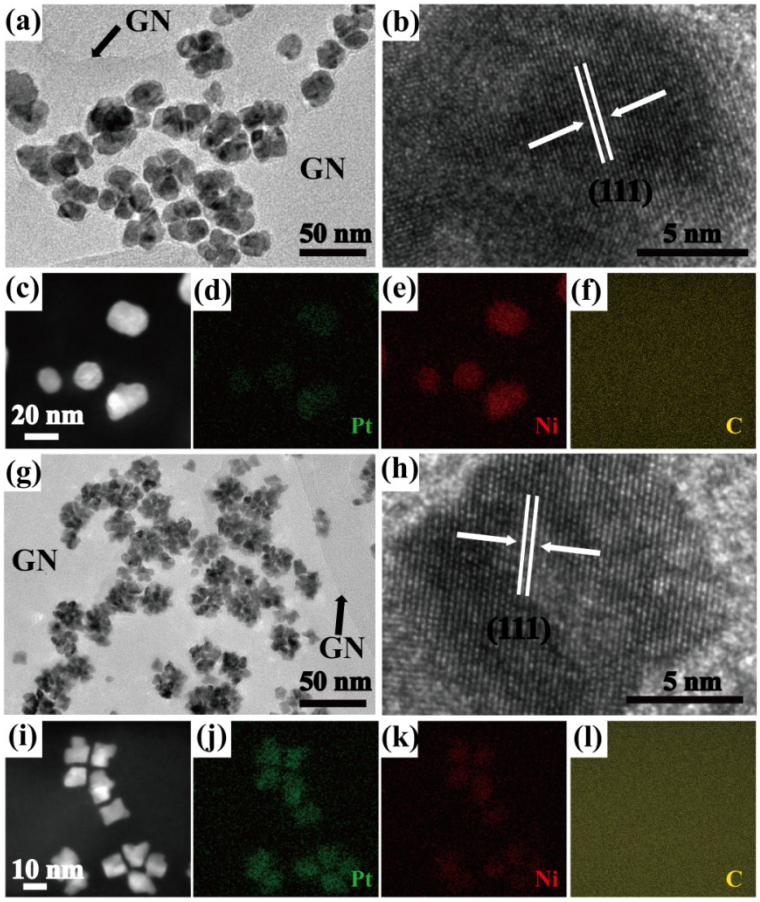

Fig. S4 (a) TEM and (b) HRTEM images of Ni_3Pt/GN nanocomposite. (c) HAADF-STEM image and (d–f) EDS mapping of Pt, Ni and C elements of Ni_3Pt/GN nanocomposites. (g) TEM and (h) HRTEM images of $NiPt_3$/GN nanocomposites. (i) HAADF-STEM image and (j–l) EDS mapping of Pt, Ni and C elements of $NiPt_3$/GN nanocomposites.

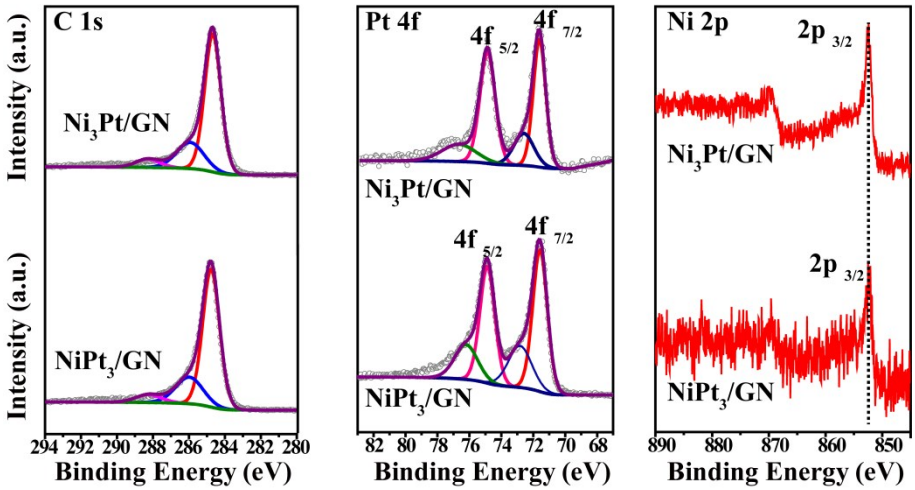

Fig. S5 XPS spectra of Ni_3Pt/GN and $NiPt_3$/GN nanocomposites. (a) C 1s, (b) Pt 4f and (c) Ni 2p spectrum.

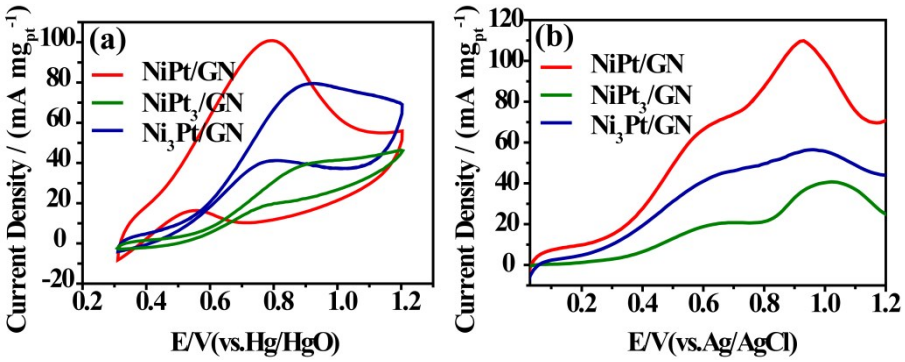

Fig. S6 Mass current density of the NiPt/GN, Ni_3Pt/GN and $NiPt_3$/GN nanocomposite electrodes in (a) the mixture of 0.5 M NaOH + 1 M methanol solution at 50 mV s^{-1} and (b) the mixture of 0.5 M H_2SO_4 + 0.5 M HCOOH solution at 50 mV s^{-1}, respectively.

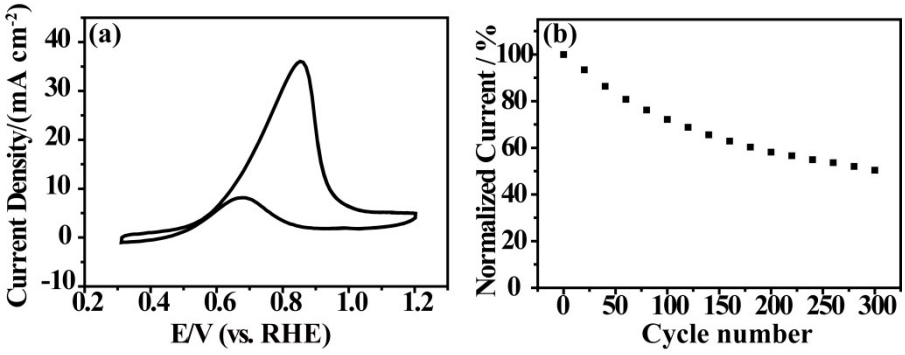

Fig. S7 (a) CVs of commercial Pt/C electrodes in 0.5 M NaOH + 1 M methanol solution, (b) The forward peak currents of commercial Pt/C as a function of the cycle

number for the methanol oxidation.

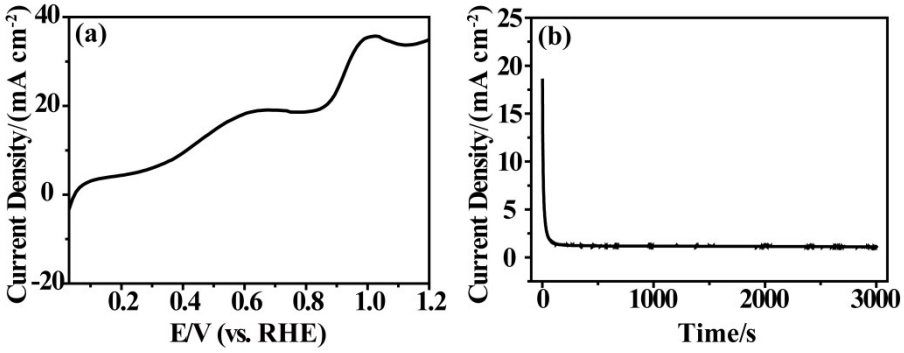

Fig. S8 (a) CVs of commercial Pt/C electrodes in 0.5 M H_2SO_4 + 0.5 M HCOOH solution, (b) Current-time curves recorded in mixture of 0.5 M H_2SO_4 + 0.5 M HCOOH solution at the working potential of 0.4 V.

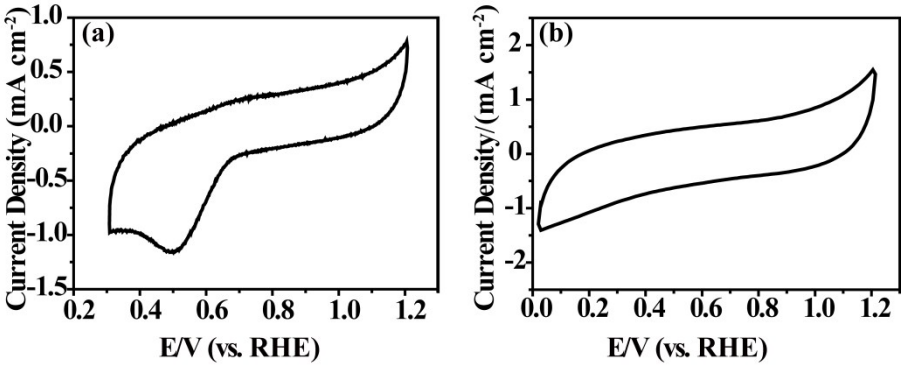

Fig. S9 CVs of the GN electrodes in (a) 0.5 M NaOH + 1 M methanol solution, (b) 0.5 M H_2SO_4 + 0.5 M HCOOH solution at 50 mV s^{-1}.

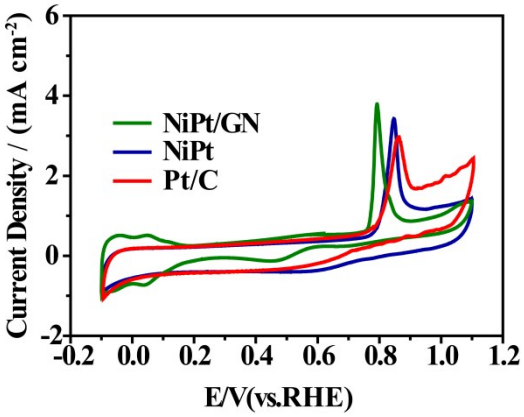

Fig. S10 CO stripping voltammograms of NiPt/GN, NiPt and commercial Pt/C at scan rate of 50 mV s-1.

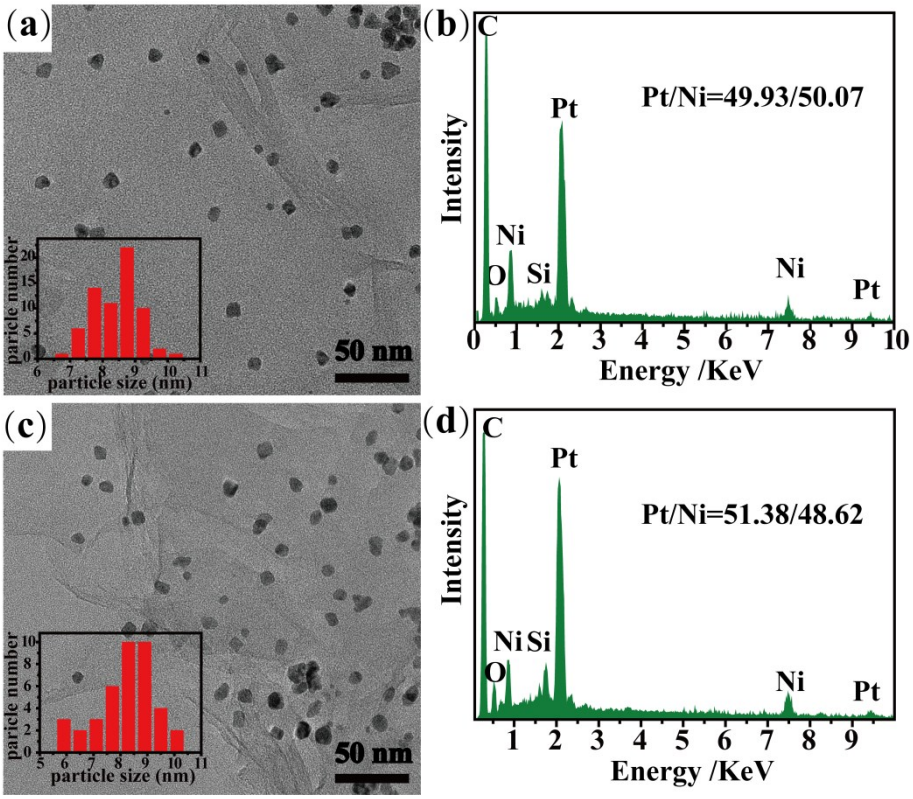

Fig. S11 TEM images of NiPt/GN nanocomposite. (a) before and (c) after 900 cycles in 0.5 M NaOH + 1 M methanol solution. SEM-EDX spectrums of the NiPt/GN (b) before and (d) after 900 cycles in 0.5 M NaOH + 1 M methanol solution.

Table S1. Ni/Pt Atom Rate Investigated by ICP

sample	Pt (mol)	Ni (mol)

NiPt	0.27	0.26
NiPt/GN	0.28	0.30
Ni_3Pt/GN	0.14	0.47
$NiPt_3$/GN	0.50	0.17

Table S2. Current density of different catalysts for DMFC

Catalyst	Current density (mA cm^{-2})	reference
NiPt/GN	41.1	This work
Pt/NS-G[a]	11.1	Ref. S1
Pt/G_3-$(CN)_7$[b]	15.7	Ref. S2
Pt/G	9.1	
Au@Pt PNPs[c]	26.05	Ref. S3
THH Pt−Ni NFs/C[d]	2.19	Ref. S4
Mesoporous PtPd NPs	1.15	Ref. S5
Concave Pt−Co	3.62	Ref. S6
Amorphous CuPt	7.8	Ref. S7
Octahedra $Pt_{2.3}Ni$/C	1.46	Ref. S8
CMK-3-Pd/SnO_2	7.81	Ref. S9
CMK-3–Pt	1.78	Ref. S10

[a] Pt nanoparticles on nitrogen and sulfur codoped graphene

[b] Pt nanoparticles on both graphene and g-C_3N_4 nanosheets

[c] The popcorn-like Au@Pt nanocrystals

[d] Tetrahexahedral Pt−Ni nanocrystals on C

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