Electronic Supplementary Material (ESI) for RSC Advances
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Supporting information

A Highly Active Hydrazine Fuel Cell Catalyst Consisting of Ni-Fe Nanoparticle Alloy pulse reversal plated on Carbon Materials

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The detailed of pulse reversal plating

An electrochemical cell with a two-electrode configuration was used for the experiments. A copper plate (10mm×10mm×1mm)was used as the cathode and a glass carbon electrode (3mm) which loaded the carbon material used as anode. After plating 23 seconds, wash the electrode with deionized water and then dired the electrode.

Table S1

Nickel iron pulse reversal plating chemistry

Nickel iron pulse reversal plating chemistry	
Nickel(II) sulfate	250g/l
Iron(II) sulfate	25.6g/l
Boric acid	40g/l
Sodium chloride	25g/l
Saccharim	2g/l
Sodium citrate	14.7g/l

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Ascorbic acid	0.5g/l
2-Butyne-1,4-diol	0.6g/l
Sodium dodecylbenzenesulphonate	0.05g/l

Table S2

Pulse reversal plating conditions

Nickel iron plating bath conditions	
Temperature	60℃
pH	4.2
Plating time	23s
Average current density	5A/dm^2
Positive pulse time	3ms
Positive duty circle	0.3
Positive average current density	5.55 A/dm^2
Reverse pulse time	3ms
Reverse duty circle	0.1
Reverse average current density	0.55 A/dm^2
Mild agitation.	

Table S3

Inductively coupled plasma spectrometry (ICP) derived compositions of the most active catalysts

Inductively coupled plasma spectrometry (ICP) derived compositions of the most active catalysts		
The concentration of Nickel(II) sulfate (g/L)	The quality of Iron(II) sulfate (g/L)	The compositions of the most active catalysts
250	5	$Ni_{95.7}Fe_{4.3}$
250	10	$Ni_{93.1}Fe_{6.9}$
250	15	$Ni_{92.0}Fe_{8.0}$
250	20	$Ni_{90.4}Fe_{9.6}$
250	25	$Ni_{86.1}Fe_{13.9}$
250	30	$Ni_{80.8}Fe_{19.2}$
250	35	$Ni_{73.7}Fe_{26.3}$
250	40	$Ni_{71.2}Fe_{28.8}$
250	45	$Ni_{67.4}Fe_{32.6}$
250	50	$Ni_{66.1}Fe_{33.9}$
250	55	$Ni_{62.6}Fe_{37.4}$
250	60	$Ni_{59.2}Fe_{40.8}$
250	65	$Ni_{58.0}Fe_{42.0}$
250	70	$Ni_{54.9}Fe_{45.1}$
250	75	$Ni_{54.7}Fe_{45.3}$

Figure S1

EDX images of MWCNTs-based and graphene-based Ni-Fe nanoparticles.

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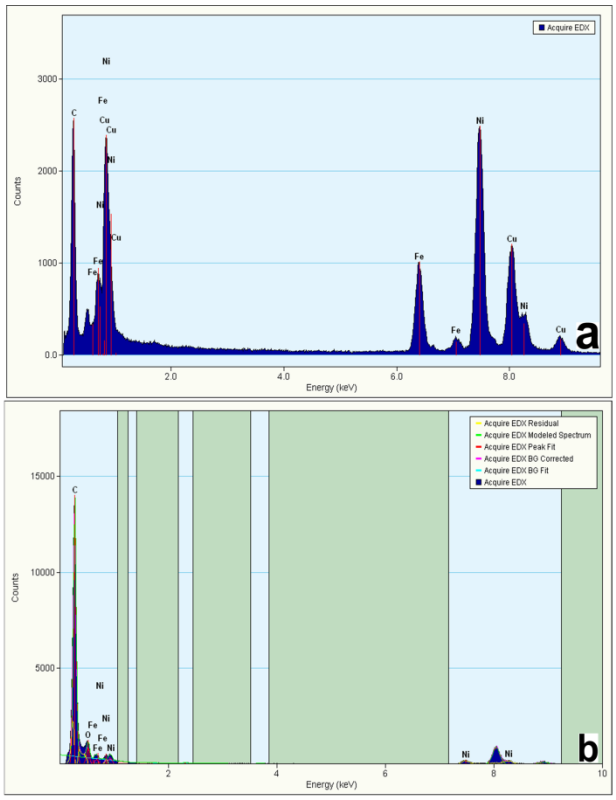

Figure 1. EDX images of (a) MWCNT-based Ni-Fe nanoparticles, (b) graphene-based Ni-Fe nanoparticles.