Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Heteroelement Y-Doped α-$Ni(OH)_2$ Nanosheets with Excellent Pseudocapacitive Performance

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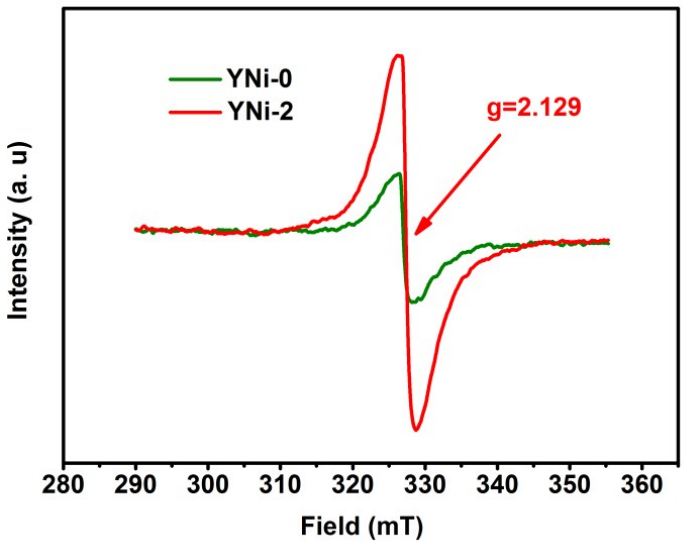

Figure S1 ESR spectrum of YNi-0 and YNi-2 nanosheets at 110 K (both samples amount used 50 mg).

Table S1 The peak position and peak area of Ni^{2+} and Ni^{3+} in Ni 2p 3/2 and Ni 2p 1/2.

Ni Element	**Ni 2p 3/2**				**Ni 2p 1/2**			
Valence State	**Ni^{2+}**		**Ni^{3+}**		**Ni^{2+}**		**Ni^{3+}**	
Peak State	Peak Position	Peak Area	Peak Position	Peak Area	Peak Position	Peak Area	Peak Position	Peak Area
YNi-0	855.4	66623.48	857.1	7746.80	873.1	41209.23	874.8	4175.33
YNi-1	855.5	58339.47	857.4	19734.43	873.2	33205.45	875.0	8968.56
YNi-2	855.6	30200.89	857.4	15451.01	873.3	21853.73	875.1	7030.53
YNi-3	855.6	29413.60	857.9	9203.92	873.4	16526.80	875.5	3658.86

Table S2 Summary of the physical characteristics of YNi-0, YNi-1, YNi-2 and YNi-3.

Sample	YNi-0	YNi-1	YNi-2	YNi-3
Specific Surface Area(m^2 g^{-1})	38.25	126.33	378.95	135.36
V_{total}(cm^3 g^{-1})	0.104096	0.289710	0.736477	0.343762
V_{mic}(cm^3 g^{-1})	0.002726	0.014402	0.033039	0.012056
V_{mec}(cm^3 g^{-1})	0.085828	0.263119	0.674853	0.320800
V_{mac}(cm^3 g^{-1})	0.015542	0.012189	0.028586	0.010906
V_{mic}/ V_{total}(%)	2.6	5.0	4.5	3.5
V_{mec}/ V_{total}(%)	82.5	90.8	91.6	93.3
V_{mac}/ V_{total}(%)	14.9	4.2	3.9	3.2

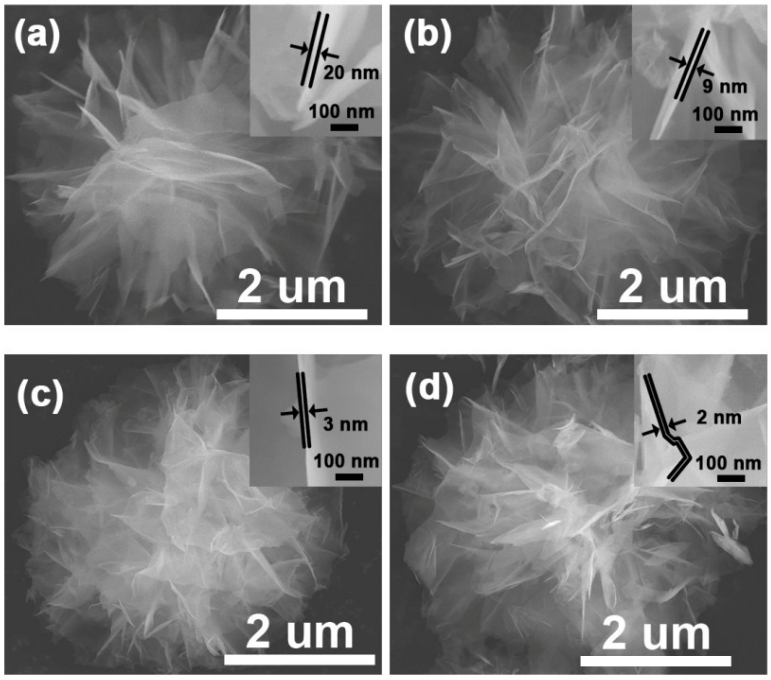

Figure S2 SEM images of (a) YNi-0, (b) YNi-1, (c) YNi-2 and (d) YNi-3, respectively.

The EDX data demonstrate that all the samples are mainly composed of Ni, O and Y elements. The quantitative analyses about the quality and atom percentage of the YNi-1, YNi-2 and YNi-3 are tabulated as follows:

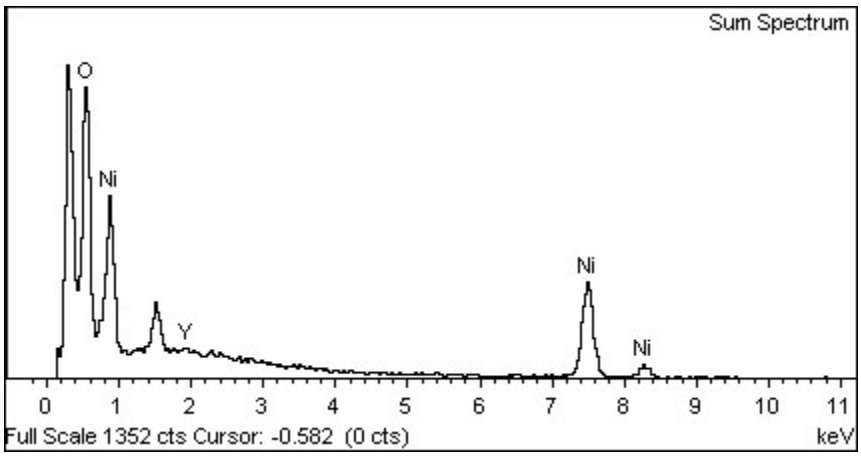

Figure S3 EDX pattern of the YNi-1.

Table S3 The quality and atom percentage of YNi-1.

Element	**Weight%**	**Atomic%**
O K	52.56	80.42
Ni K	45.99	19.18
Y L	1.45	0.40
Totals	100.00	

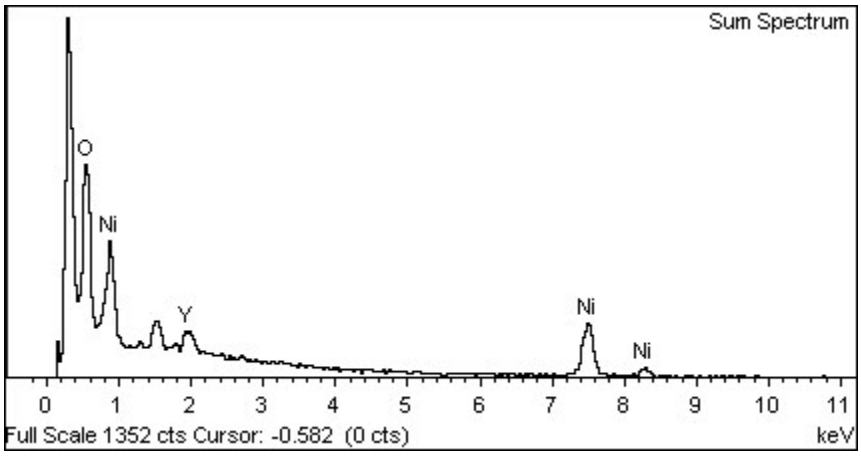

Figure S4 EDX pattern of the YNi-2.

Table S4 The quality and atom percentage of YNi-2.

Element	**Weight%**	**Atomic%**
O K	56.88	83.74
Ni K	35.50	14.24
Y L	7.62	2.02
Totals	100.00	

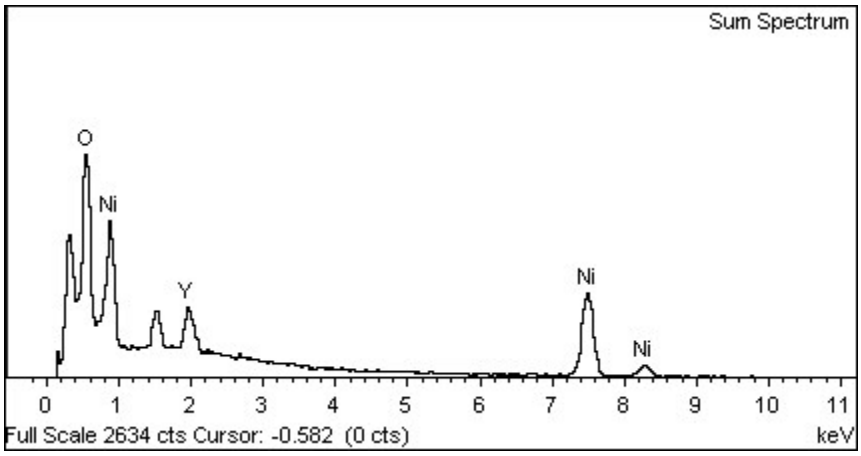

Figure S5 EDX pattern of the YNi-3.

Table S5 The quality and atom percentage of YNi-3.

Element	Weight%	Atomic%
O K	46.90	77.78
Ni K	41.53	18.77
Y L	11.58	3.46
Totals	100.00	

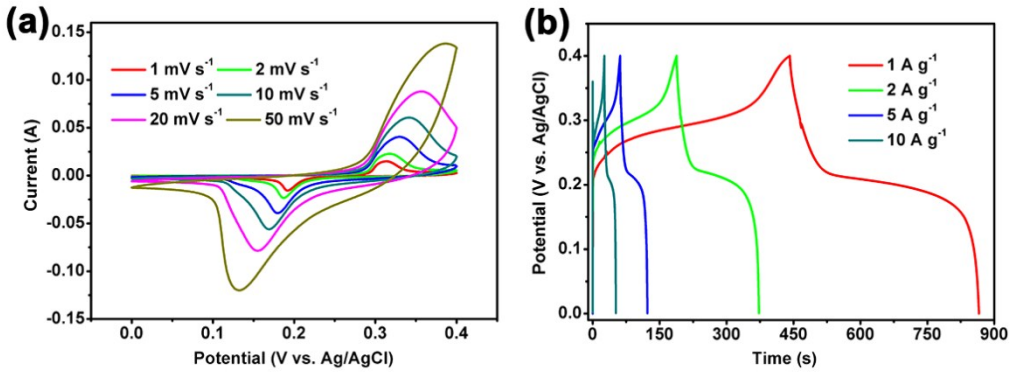

Figure S6 (a) CV curves of the YNi-0 at different scan rates from 1 to 50 mV s^{-1}, and (b) GCD curves of the YNi-0 at different current densities from 1 to 10 A g^{-1}.

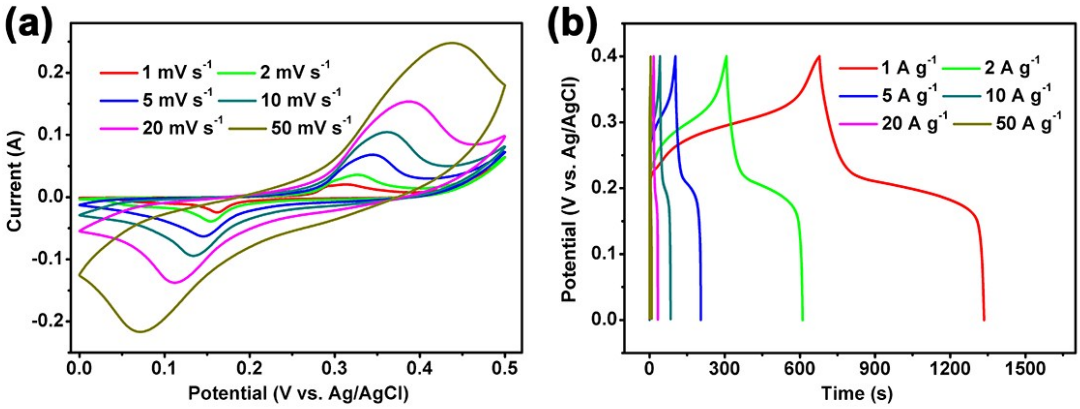

Figure S7 (a) CV curves of the YNi-1 at different scan rates from 1 to 50 mV s^{-1}, and (b) GCD curves of the YNi-1 at different current densities from 1 to 50 A g^{-1}.

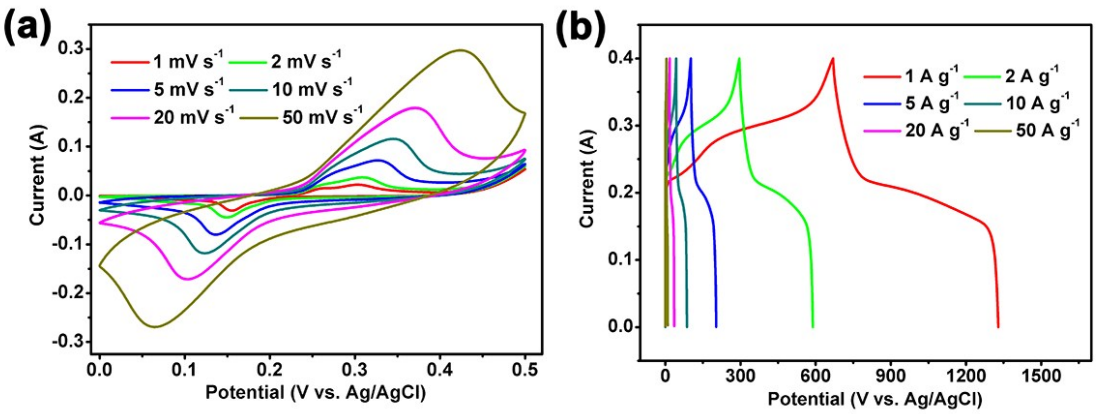

Figure S8 (a) CV curves of the YNi-3 at different scan rates from 1 to 50 mV s^{-1}, and (b) GCD curves of the YNi-3 at different current densities from 1 to 50 A g^{-1}.

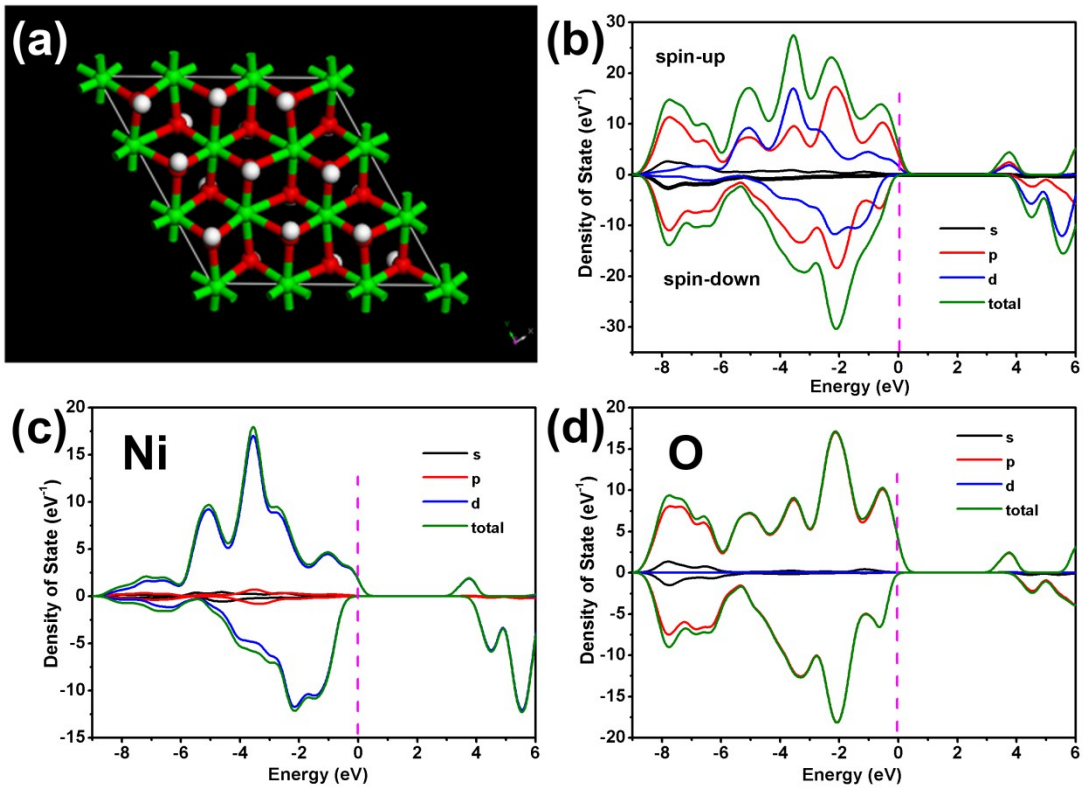

Figure S9 (a) Schematic structure model of pure *a*-Ni(OH)$_2$ single layer viewed along the *c*-axis, (b) calculated total DOS/PDOS, (c) Ni element and (d) O element for pure *a*-Ni(OH)$_2$. The Fermi level was denoted by the vertical line.

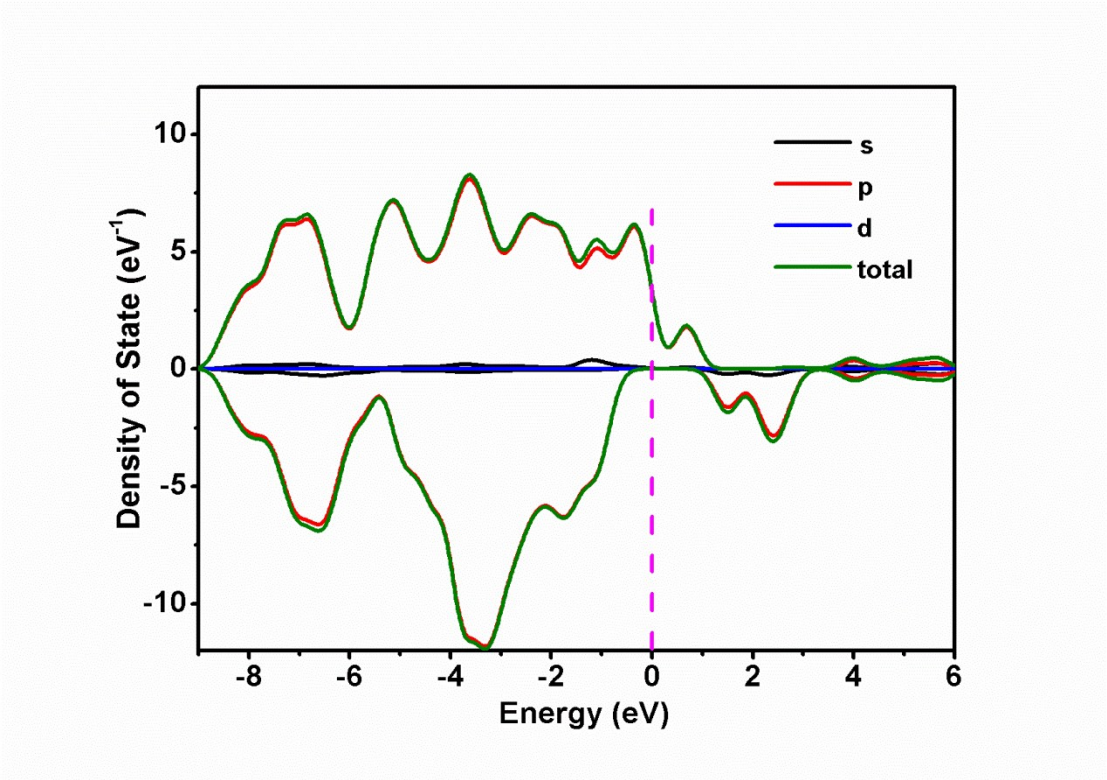

Figure S10 Calculated PDOS for O element in 12% Y-doped *a*-Ni(OH)$_2$.

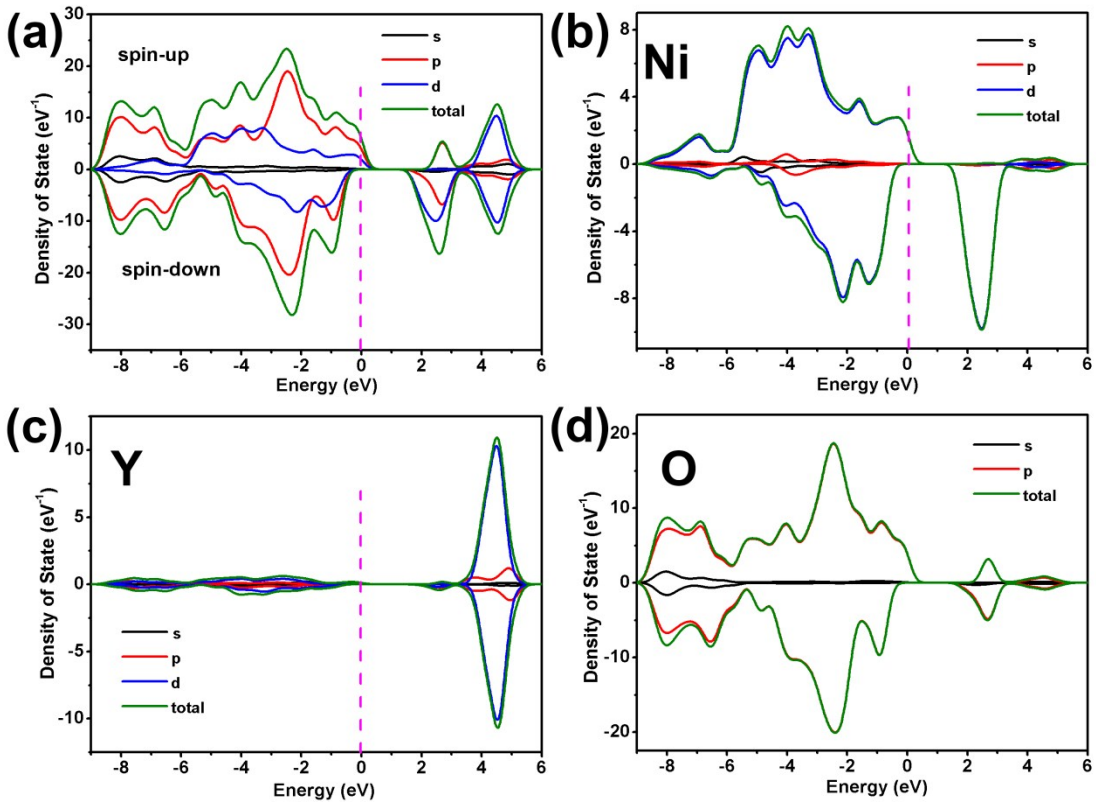

Figure S11 (a) Calculated total DOS/PDOS, (b) Ni element, (c) Y element and (d) O element for 33%Y-doped $Ni(OH)_2$. The Fermi level was denoted by the vertical line.