Supplementary Information

Environmentally friendly room temperature synthesis of hierarchical porous α-$Ni(OH)_2$ nanosheets for supercapacitor and catalysis applications

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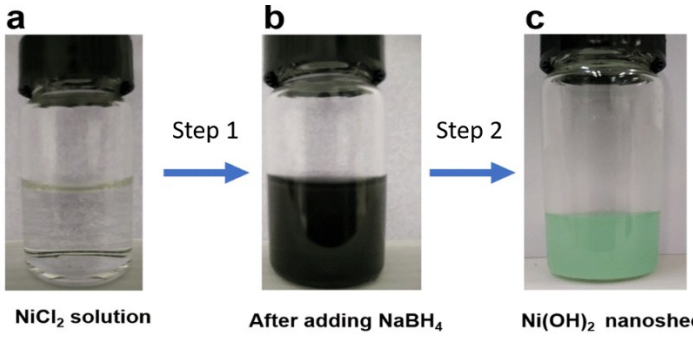

Fig. S1 The color changes in the preparation process of hierarchical porous α-$Ni(OH)_2$ nanosheets.

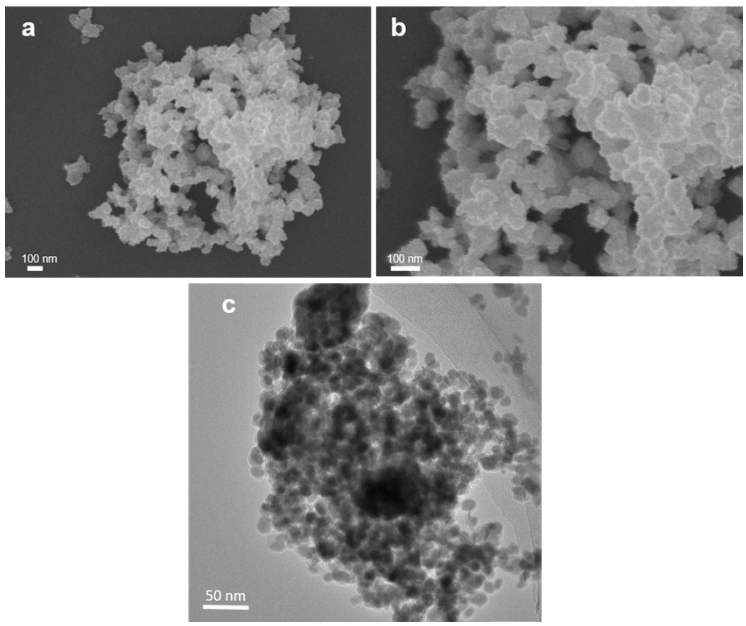

Fig. S2 (a, b) SEM images and (c) TEM image of as-synthesized nickel nanoparticles.

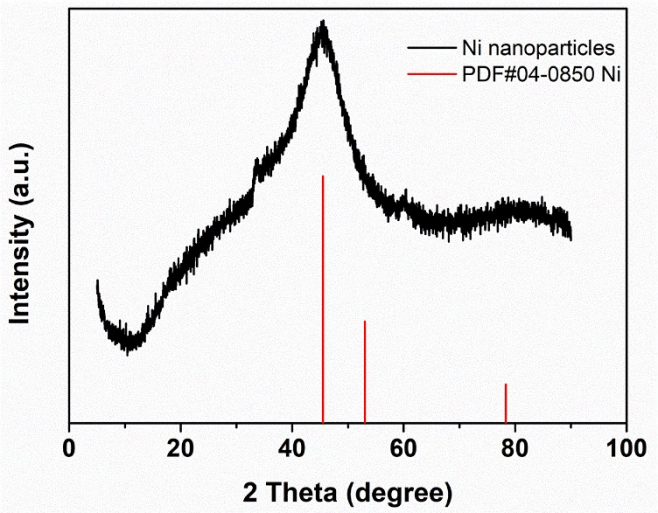

Fig. S3 XRD pattern of as-synthesized Ni nanoparticles.

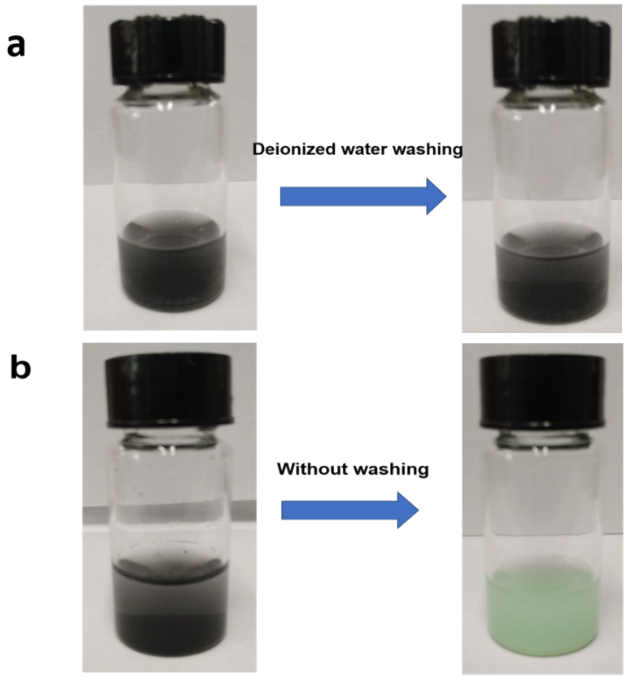

Fig. S4 Color changes of solution with Ni nanoparticles. (a) Ni nanoparticles prepared in the first step were washed using deionized water and then stocked in the fresh deionized water. (b) Ni nanoparticles prepared in the first step were not washed and kept stationary state in the origin solution.

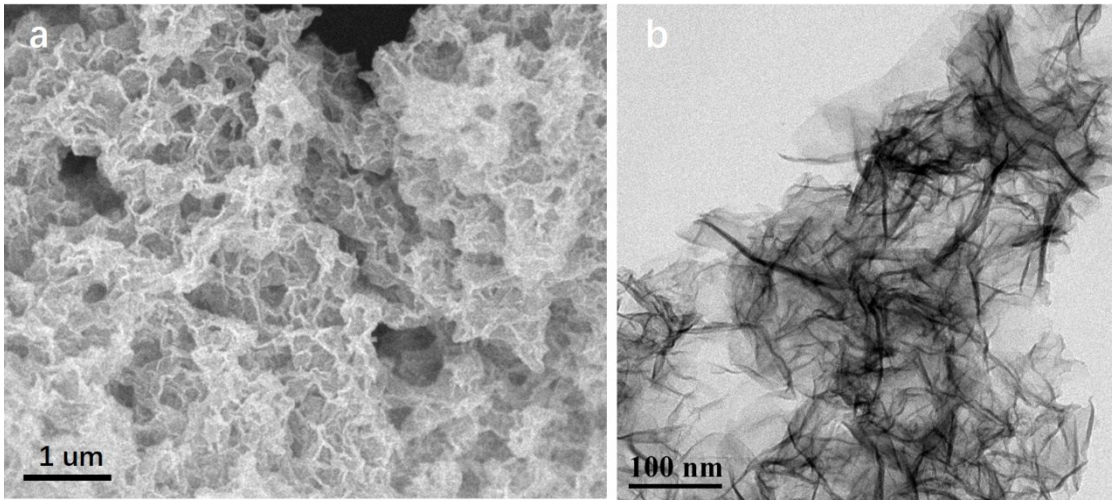

Fig. S5 (a) SEM image and (b) TEM image of the α-$Ni(OH)_2$ electrode materials after cycling test.

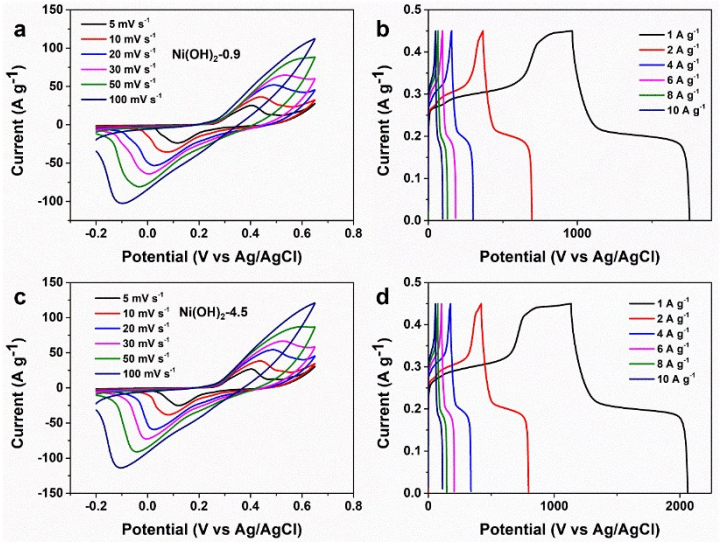

Fig. S6 (a, b) CV curves at various sweeping rates and GCD curves at various current densities for $Ni(OH)_2$-0.9. (c, d) CV curves at various sweeping rates and GCD curves at various current densities for $Ni(OH)_2$-4.5.

Table S1 Comparative capacitance of α-$Ni(OH)_2$ nanosheets with other reported $Ni(OH)_2$ structures.

S. no.	Structural morphology	Electrolyte	Specific Capacitance ($F\ g^{-1}$)	Current density ($A\ g^{-1}$)	Ref.
1	$Ni(OH)_2$ nanospheres	1M KOH	694.5	1	1
2	$Ni(OH)_2$ nanoplates	2M NaOH	793	1	2
3	$Ni(OH)_2$ microspheres	2 M KOH	1280.9	0.5	3
4	$Ni(OH)_2$ nanosheets	1 M NaOH	880	2	4
5	Nanocrystal β-$Ni(OH)_2$	6 M KOH	1566	1	5
6	Flowerlike α-$Ni(OH)_2$	6 M KOH	2030	1	6
7	Y-doped α-$Ni(OH)_2$ nanosheets	6 M KOH	1860	1	7
8	Flower-like a-$Ni(OH)_2$	2 M KOH	810.4	1	8
9	α-$Ni(OH)_2$ nanobristles	1 M KOH	2090	2	9
10	$Ni(OH)_2$ nanosheets	6 M KOH	2064	2	10
11	3D flower-like β-$Ni(OH)_2$	2M KOH	1567	1	11
12	$Ni(OH)_2$ nanosheets	6 M KOH	2080.8	0.6	12
13	β-$Ni(OH)_2$ nanoplates	1 M KOH	1807	2	13
14	$Ni(OH)_2$ nanoparticles	2M KOH	291	0.5 mA cm^{-2}	14
15	Hexagonal $Ni(OH)_2$	3M KOH	578	2.5 mA	15
16	β-$Ni(OH)_2$ nanoparticles	1M KOH	715.3	0.5	16
17	$Ni(OH)_2$ nanowires	6M KOH	833	5 mA cm^{-2}	17
18	**α-$Ni(OH)_2$ nanosheets**	**2M KOH**	**2378.7**	**1**	**This work**

1. J. Tizfahm, B. Safibonab, M. Aghazadeh, A. Majdabadi, B. Sabour and S. Dalvand, *Colloids Surf., A* 2014, **443**, 544-551.
2. Y. Ren, L. Wang, Z. Dai, X. Huang, J. Li, N. Chen, J. Gao, H. Zhao, X. Sun and X. He, *Int. J. Electrochem. Sci.*, 2012, **7**, 12236-12243.
3. H. Du, Y. Wang, H. Yuan and L. Jiao, *Electrochim. Acta*, 2016, **196**, 84-91.
4. J. S. Chen, Y. Gui and D. J. Blackwood, *Electrochim. Acta*, 2016, **188**, 863-870.
5. A. M. Elshahawy, K. H. Ho, Y. Hu, Z. Fan, Y. W. B. Hsu, C. Guan, Q. Ke and J. Wang, *CrystEngComm.*, 2016, **18**, 3256-3264.
6. X. Zhang, C. Li, W. Miao, X. Sun, K. Wang and Y. Ma, *Sci. China Technol. Sc*, 2015, **58**, 1871-1876.
7. Y. Zhang, Y. Zhao, W. An, L. Xing, Y. Gao and J. Liu, *J. Mater. Chem. A*, 2017, **5**, 10039-10047.
8. Y. Zhang, Y. Liu, Y. Guo, Y. X. Yeow, H. Duan, H. Li and H. Liu, *Mater. Chem. Phy.*, 2015, **151**, 160-166.
9. X. Meng and D. Deng, *J. Mater. Chem. A*, 2016, **4**, 6919-6925.

10. W. Sun, X. Rui, M. Ulaganathan, S. Madhavi and Q. Yan, *J. Power Sources*, 2015, **295**, 323-328.
11. N. Parveen and M. H. Cho, *Sci. Rep.*, 2016, **6**, 27318.
12. H. Cui, J. Xue and M. Wang, *Adv. Powder Technol.*, 2015, **26**, 434-438.
13. X. Ma, Y. Li, Z. Wen, F. Gao, C. Liang and R. Che, *ACS Appl. Mater. Interfaces*, 2014, **7**, 974-979.
14. S. Vijayakumar and G. Muralidharan, *J. Electroanal. Chem.*, 2014, **727**, 53-58.
15. D.-D. Zhao, S.-J. Bao, W.-J. Zhou and H.-L. Li, *Electrochem. Commun.*, 2007, **9**, 869-874.
16. M. Aghazadeh, A. N. Golikand and M. Ghaemi, *Int. J. Hydrogen Energy*, 2011, **36**, 8674-8679.
17. Y.X. Wang, Z.A. Hu and H.Y. Wu, *Material Chem. Phy.*, 2011, **126**, 580-583.