Supplementary information

Fig. S1 SEM image of Co₃O₄@NF before calcination.



Fig. S2 SEM image of powder $Ni_3Mn_1LDH@Co_3O_4$ obtained from the same preparation process without Ni foam.





Fig. S3 CV curves at different scan rates and GCD curves at different current densities for (a-b) Ni₁Mn₁LDH@Co₃O₄, (c-d) Ni₁Mn₃LDH@Co₃O₄ and (e-f) Co₃O₄ grown on nickel foam.

Fig. S4 Representative SEM image of Ni₃Mn₁LDH@Co₃O₄ electrode after circulation.



Fig. S5 EIS measurements of NiMnLDH@ Co_3O_4 //AG before and after 5000 cycles. The inset shows the enlarged nyquist plots.



Table S1 Comparisons of the electrochemical performance (based on active materials) withvarious reported similar electrode materials for supercapacitors utilizing alkaline aqueouselectrolytes in three-electrode system.

Electrolyte s	Specific capacitance	Rate capability	Cyclic stability (cycling	Ref.
			numbers)	
6 M KOH	250 F g ⁻¹	69.4%	-	[1]
	(at 20 A g ⁻¹)	(at 20 A g ⁻¹)		
2 М КОН	178 F g ⁻¹	66%	56.7%	[2]
2	(at 2 A g ⁻¹)	(at 40 A g ⁻¹)	(5000)	[-]
	169 Ε σ ⁻¹	17.9%	07%	
2 M KOH	$(a \pm 10 \text{ m})(c^{-1})$	(at 200 mV	(200)	[3]
		S⁻¹)	(200)	
	<u>Э17 Г а-1</u>	86.6%	06.20/	
1 M KOH	217 Fg	(at 20 mA	90.5%	[4]
	(at 1 mA cm ⁻)	cm⁻²)	(600)	
	1 <u>22 г ~-1</u>	700/	050/	
	$123 F g^{-1}$	/8%	95%	
	(at 1 A g ⁻)	(at 10 A g ⁻)	(1000)	[6]
	• • • • • •		4.4.50/	[5]
	245 F g ⁻¹	/3%	116%	
	(at 1 A g⁻¹)	(at 10 A g ⁻¹)	(1000)	
	150 F g ⁻¹	25%	68%	
	(at 30 A g ⁻¹)	(at 30 A g ⁻¹)	(5000)	
1 M KOH		75%		[6]
	162.6 mF cm ⁻²	(at 16 mA	80%	
	(at 16 mA cm ⁻²)	, cm⁻²)	(10000)	
		,		This
6 М КОН	607.9 F g ⁻¹	77.14%	99.9%	wor
	(at 0.5 A g ⁻¹)	(at 3 A g ⁻¹)	(1000)	k
	Electrolyte s 6 M KOH 2 M KOH 2 M KOH 1 M KOH 1 M KOH 6 M KOH	Electrolyte s Specific capacitance 6 М КОН 250 F g ⁻¹ (at 20 A g ⁻¹) 2 М КОН 178 F g ⁻¹ (at 2 A g ⁻¹) 2 М КОН 169 F g ⁻¹ (at 10 mV s ⁻¹) 2 М КОН 169 F g ⁻¹ (at 10 mV s ⁻¹) 1 М КОН 217 F g ⁻¹ (at 1 mA cm ⁻²) 1 М КОН 123 F g ⁻¹ (at 1 A g ⁻¹) 1 М КОН 245 F g ⁻¹ (at 1 A g ⁻¹) 1 М КОН 150 F g ⁻¹ (at 30 A g ⁻¹) 1 М КОН 162.6 mF cm ⁻² (at 16 mA cm ⁻²) 6 М КОН 607.9 F g ⁻¹ (at 0.5 A g ⁻¹)	Electrolyte Specific capacitance Rate capability 6 M KOH 250 F g ⁻¹ (42 0 A g ⁻¹) (42 0 A g ⁻¹) 69.4% (42 0 A g ⁻¹) (42 0 A g ⁻¹) 2 M KOH 178 F g ⁻¹ (66% (42 0 A g ⁻¹) (41 40 A g ⁻¹) (41 40 A g ⁻¹) 17.9% (42 0 0 mV (42 00 mV) (42 00 mV) (5 ⁻¹) (42 0 mA) (42 00 mV) (5 ⁻¹) (42 0 mA) (42 00 mV (5 ⁻¹) (41 0 mV s ⁻¹) 86.6% (42 00 mV (42 00 mV) (5 ⁻¹) (42 00 mV) (5 ⁻¹) (42 00 mV) (5 ⁻¹) (42 0 mA) (42 00 mA) (61 0 A g ⁻¹) 1 M KOH 217 F g ⁻¹ (41 1 mA cm ⁻²) (41 20 mA) (41 20 mA) (61 0 A g ⁻¹) 86.6% (42 0 mA) (61 0 A g ⁻¹) (41 10 A g ⁻¹) 1 M KOH 217 F g ⁻¹ (41 1 A g ⁻¹) (41 10 A g ⁻¹) (41 10 A g ⁻¹) 78% (41 1 A g ⁻¹) (41 10 A g ⁻¹) 1 M KOH 245 F g ⁻¹ 73% (41 10 A g ⁻¹) (41 30 A g ⁻¹) 75% (41 30 A g ⁻¹) (41 30 A g ⁻¹) 1 M KOH 150 F g ⁻¹ 25% (41 30 A g ⁻¹) (41 30 A g ⁻¹) (41 16 mA cm ⁻²)	Electrolyte Specific capacitance Rate capability Stability (cycling numbers) 6 M KOH 250 F g ⁻¹ (at 20 A g ⁻¹) (at 20 A g ⁻¹) 6 M KOH 250 F g ⁻¹ (at 20 A g ⁻¹) (at 20 A g ⁻¹) 2 M KOH 178 F g ⁻¹ (at 20 A g ⁻¹) (at 40 A g ⁻¹) (5000) 2 M KOH 169 F g ⁻¹ (at 10 mV s ⁻¹) (at 200 mV (200) s ⁻¹) (200) 97% (at 20 mAV (200) s ⁻¹) (200) 2 M KOH 169 F g ⁻¹ (at 1 mA cm ⁻²) (at 20 mA (at 20 mA) (200) s ⁻¹) (200) 96.3% (at 20 mA (600) cm ⁻²) (200) 1 M KOH 217 F g ⁻¹ (at 1 A g ⁻¹) (at 10 A g ⁻¹) (1000) 96.3% (at 20 mA (600) cm ⁻²) (200) 1 M KOH 213 F g ⁻¹ 7 75% (at 10 A g ⁻¹) (1000) 95% (at 10 A g ⁻¹) (1000) 1 M KOH 245 F g ⁻¹ 73% (at 10 A g ⁻¹) (1000) 16% (at 30 A g ⁻¹) (2500) 1 M KOH 150 F g ⁻¹ 25% 68% (at 10 A g ⁻¹) (1000) 68% (at 10 A g ⁻¹) (1000) 1 M KOH 150 F g ⁻¹ 75% (at 30 A g ⁻¹) (2500) 80% (at 16 mA (cm ⁻²) (200) (200) 1 M KOH 607.9 F g ⁻¹ 75% (at 16 mA (cm ⁻²) (200) (200) (200) 75% (at 16 mA (cm ⁻²) (200) (200) (200)

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Samples	Before cycling		After cycling				
	R_s (Ω cm ²)	R_{ct} ($\Omega \ {\rm cm^2}$)	R_s ($\Omega \ {\rm cm^2}$)	R_{ct} ($\Omega \ {\rm cm}^2$)			
Ni ₁ Mn ₃ LDH@Co ₃ O ₄	0.90	1.20	0.73	1.87			
Ni ₁ Mn ₁ LDH@Co ₃ O ₄	0.86	1.04	0.75	1.51			
Ni ₃ Mn1 LDH@Co ₃ O ₄	0.95	0.74	0.90	1.01			

Table S2 The combinational resistance (R_s) and charge-transfer resistance (R_{ct}) before and aftercycling of these samples.