Supporting Information for

"Low-cost and high-performance of a vertically grown 3D Ni-Fe layered double hydroxide/graphene aerogel supercapacitor electrode material"

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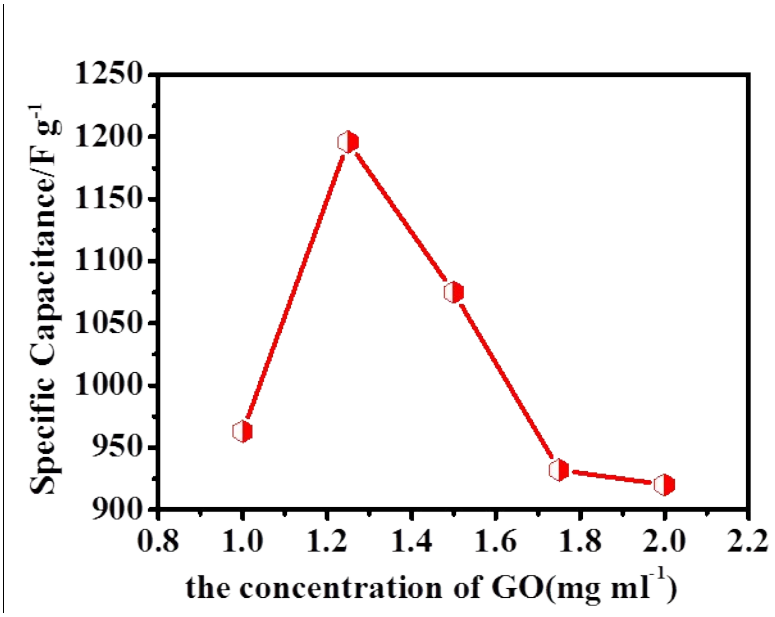

Figure S1 The specific capacitance curve of sample with different ratio of GO in 1A g^{-1}.

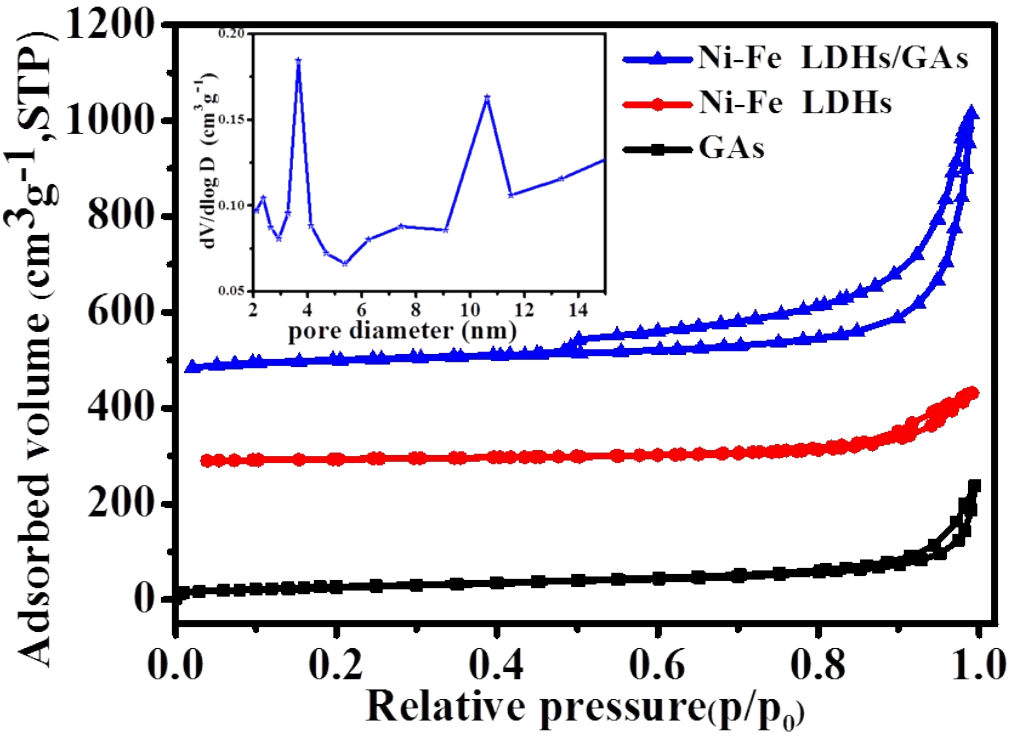

Figure S2 The N_2 adsorption-desorption isotherms for (a) 3D Ni-Fe LDH /GHA, (b) pure Ni-Fe LDH and (c) GAs ,the inset is the pore size distribution plot of the 3D Ni-Fe LDH /GHA.

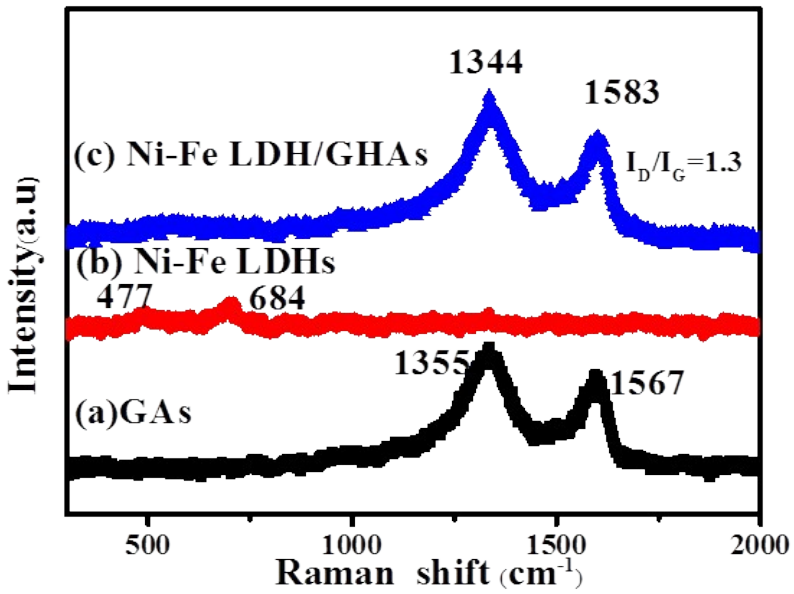

Figure S3: Raman spectra of (a) GAs, (b) pure Ni-Fe LDH and (c) 3D Ni-Fe LDH /GHA.

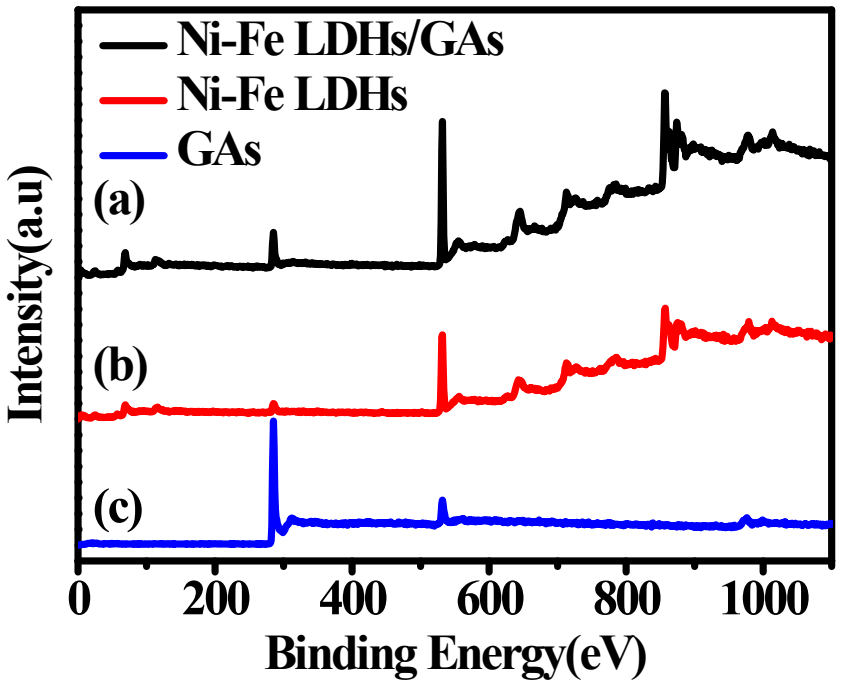

Figure S4 XPS survey spectrum of (a) 3D Ni-Fe LDH /GHA, (b) pure Ni-Fe LDH and (c) GAs**.**

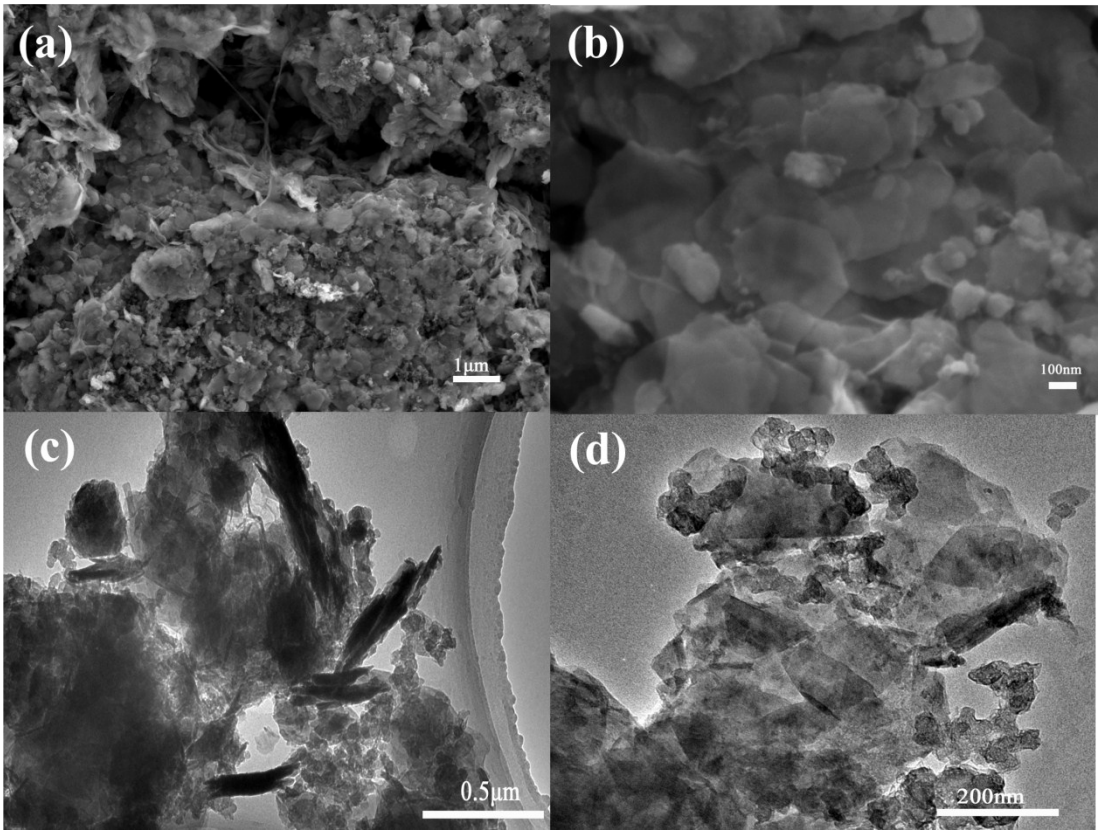

Figure S5 (a, b) SEM and (c, d) TEM images of Ni-Fe LDHs /GHA electrodes after prolonged electrochemical cycles, revealing Ni-Fe LDHs remain well-confined within GA after cycling test. The black nanoparticles irregularly dispersed around the samples are carbon black, which widely be used as the conductive agent.

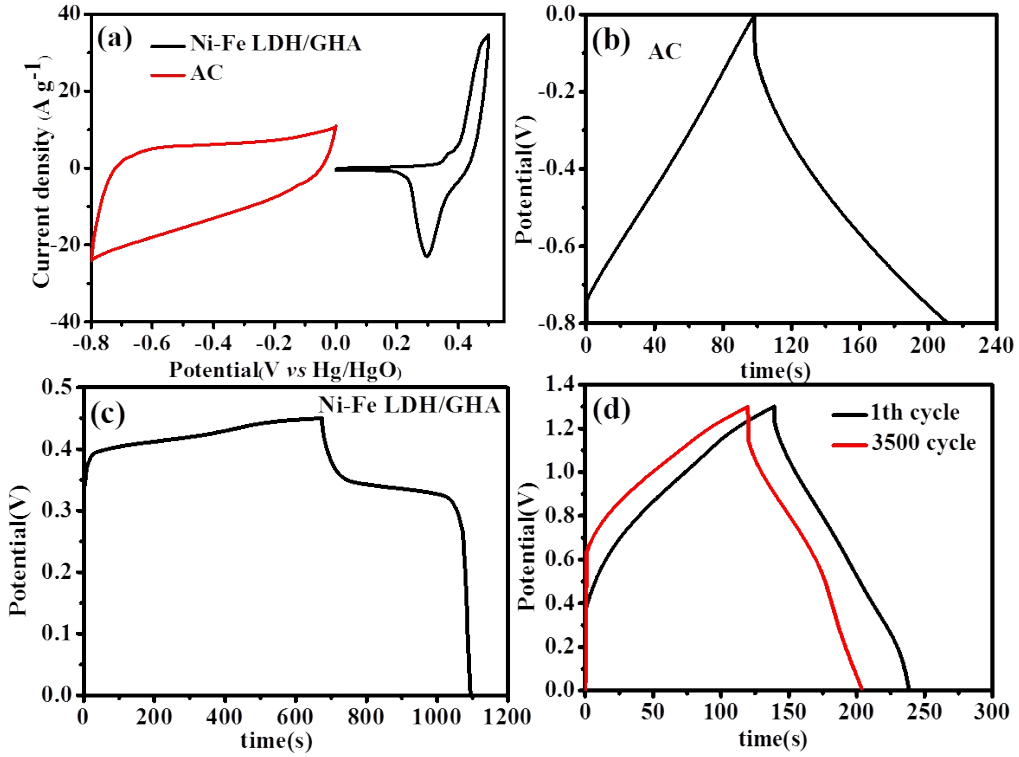

Figure S6 (a) CV curves of AC and Ni-Fe LDHs /GHA in three-electrode, (b, c) GCD curves of AC and Ni-Fe LDH/GHA in three-electrode at 1A g^{-1}, (d) Stability representing GCD curves of Ni-Fe LDH /GHA//AC asymmetric supercapacitors at 1 A g^{-1}.

Table S1. Electrochemical properties of various LDHs, LDHs and graphene based composite materials.

Material	Highest Specific Capacitance(F/g)	Rate capability	reference
Ni-Al LDH/Ni foam	701 (10 mA cm-2)	57.2% (40 mA cm^{-2})	[S1]
Co-Al LDH /graphene	1043 (1 A g^{-1})	72% (50 mA cm^{-2})	[S2]
Co–Al LDHs/Pt	734 (1 A g^{-1})	61% (25 A g^{-1})	[S3]
Co–Al LDH	772 (1 A g^{-1})	80% (25 A g^{-1})	[S4]
Co-Fe LDH	728 (1 A g^{-1})	84% (2A g^{-1})	[S5]
Ni–Co–Al LDH/RGO/CNT	1188 (1 A g^{-1})	71% (10 A g^{-1})	[S6]
Ni-Fe LDH/GHA	1196(1 A g^{-1})	72% (10 A g^{-1})	This work

Table S2. Comparison studies for the reported LDH-based asymmetric supercapacitors

Positive materials// negative materials	Specific Capacitance (F g^{-1})	Energy density (Wh · kg^{-1})	Power density (W · kg^{-1})	Reference
Co-Mn LDH//AC	29.3	5.9	250	[S7]
NiCo-LDH //GOMC	112	33.7	5400	[S8]
Ni-Al LDH/rGO//AC	39.5	8.07	3420	[S9]
Co-Al LDH //AC	96	44.8	8500	[S10]
Ni-Mn LDH/rGO//AC	84.26	21.95	850	[S11]
Ni-Fe LDH/GHA//AC	91.3	21.3	356	This work

Reference

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