Structural Optimization of Novel One-Dimensional Composite Based on In-situ Grown 1D CNTs with Amorphous Structure and 2D MoS_2 Nanosheets for Improved Li Storage

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Supporting Information

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Captions

Table S1 Specific surface area of MoS_2@C-L and MoS_2@C-H.

Table S2 EIS Fitting resistance of MoS_2@C , MoS_2@C-L and MoS_2@C-H.

Fig.S1 SEM images of **(a,e)** MoS_2@C-L,**(b,e)** MoS_2@C,**(c,e)** MoS_2@C-H.

Fig.S2 EDS mapping of MoS_2@C **(b)** C, **(c)** Mo, **(c)** S.

Fig.S3 SEM images of **(a)** MoS_2@C-L,**(b)** MoS_2@C-L2,**(c)** MoS_2@C-L4, **(d)**MoS_2@C-L8, **(e)** MoS_2@C-L12, **(f)** MoS_2@C-L.

Fig.S4 SEM images of **(a)** MoS_2@C-H1, **(b)** MoS_2@C-H2, **(c)** MoS_2@C-H4, **(d)** MoS_2@C-H8, **(e)**MoS_2@C-H12, **(f)** MoS_2@C-H.

Fig.S5 XRD patterns of **(a)** MoS_2@C-L,**(b)** MoS_2@C-H.

Fig.S6 Raman spectra of MoS_2@C.

Fig.S7 TGA result of MoS_2@C.

Fig.S8 Rate capability of MoS_2@C cycled at various rates from 0.1 to 5.0 Ag^{-1}.

Fig.S9 MoS_2@C-L8, MoS_2@C-L12 and MoS_2@C-L at a current density of **(a)** 0.2 Ag^{-1}, **(b)** 1Ag^{-1}.

Fig.S10 MoS_2@C-H8, MoS_2@C-H12 and MoS_2@C-H at a current density of **(a)** 0.2 Ag^{-1}, **(b)** 1Ag^{-1}.

Fig.S11 EIS of **(a)** MoS_2@C-L8, MoS_2@C-L12 and MoS_2@C-L,**(b)** MoS_2@C-H8, MoS_2@C-H12 and MoS_2@C-H.

Table S1

	MoS_2@C-L	MoS_2@C-H
BET Surface Area(m^2g^{-1})	64.3534	35.1899
Langmuir Surface Area(m^2g^{-1})	65.7454	27.2338
Adsorption average pore size (nm^2)	5.48244	5.19043
BJH Adsorption mean hole width(nm^2)	14.7987	8.5994
BJH Desorption Mean Pore width(nm^2)	5.9646	6.4407
Single point adsorption total pore volume of pores less than 40.4123 nm^2 width at P/Po = 0.950000000 (cm^3g^{-1})	0.088203	0.045663
correlation coefficient	0.9999159	0.9998018

Table S2

	Rf(Ω)	Rct(Ω)
MoS_2@C	449.5	72.3
MoS_2@C-L8	1368	696
MoS_2@C-L12	867.4	263.8
MoS_2@C-L	937.5	342.4
MoS_2@C-H8	538	137.1
MoS_2@C-H12	1056	128.2
MoS_2@C-H	1449	180

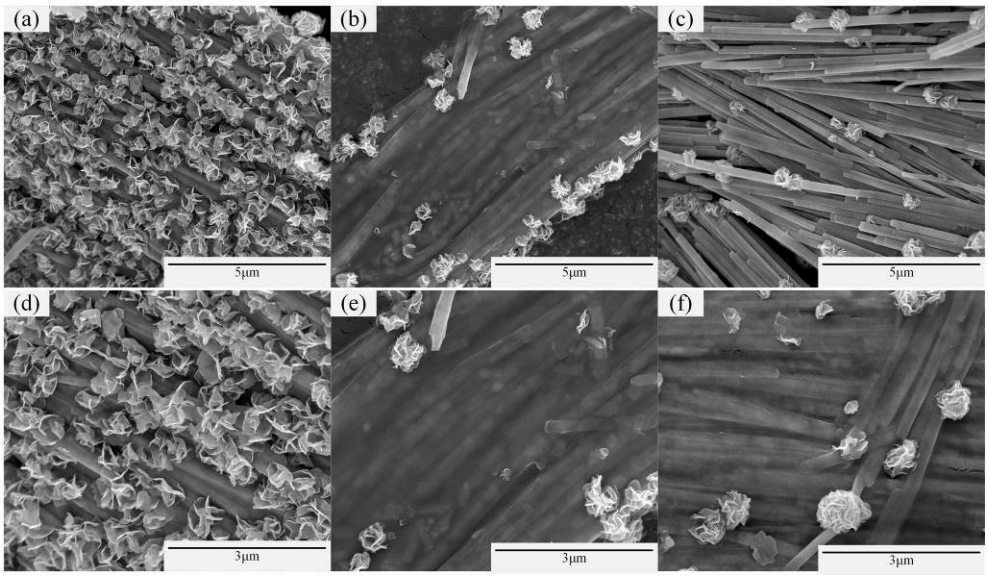

Fig.S1

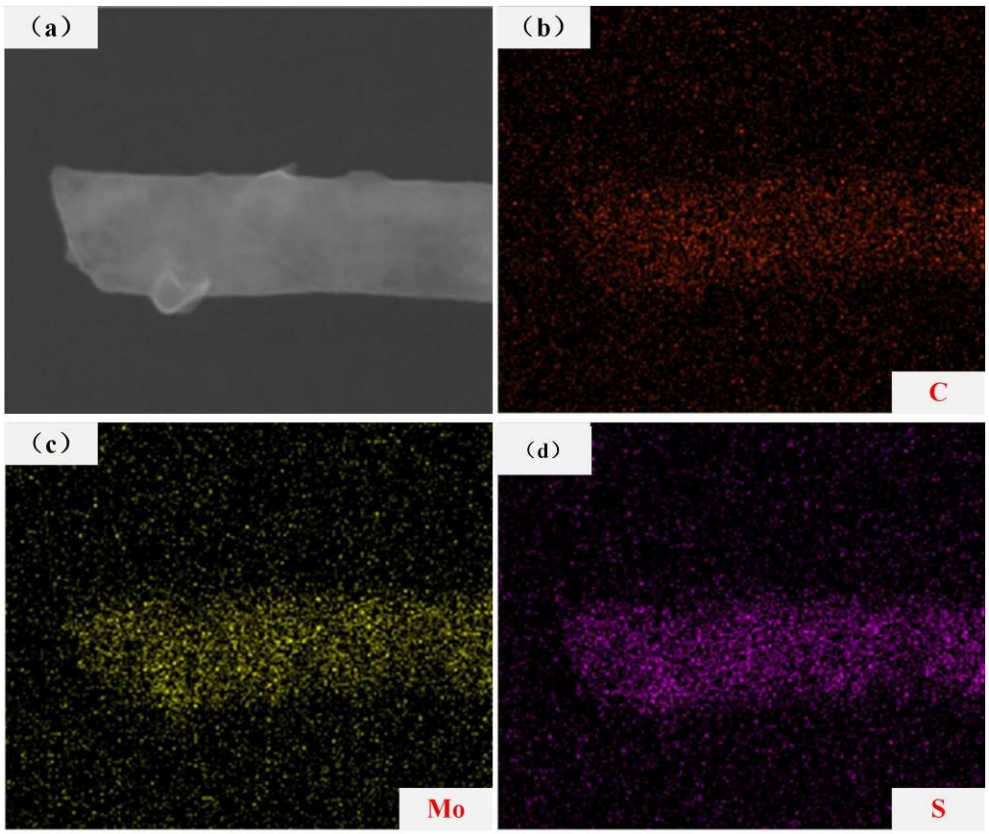

Fig.S2

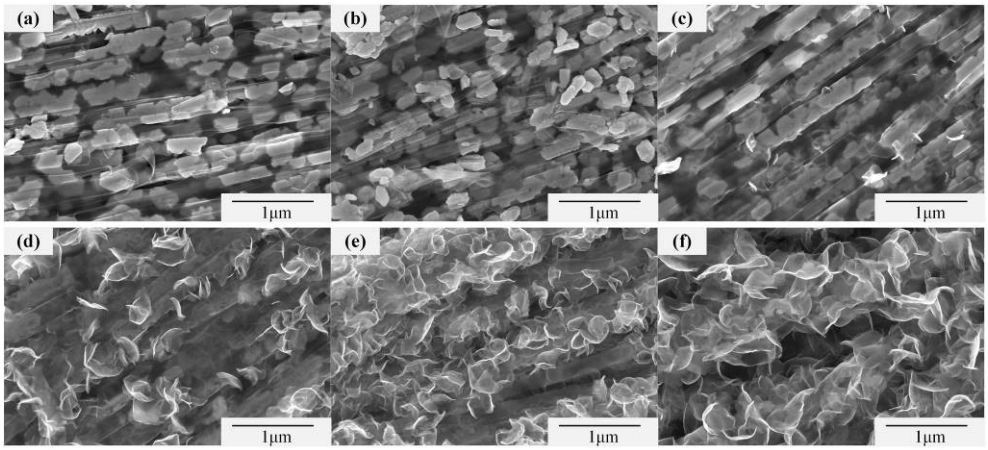

Fig.S3

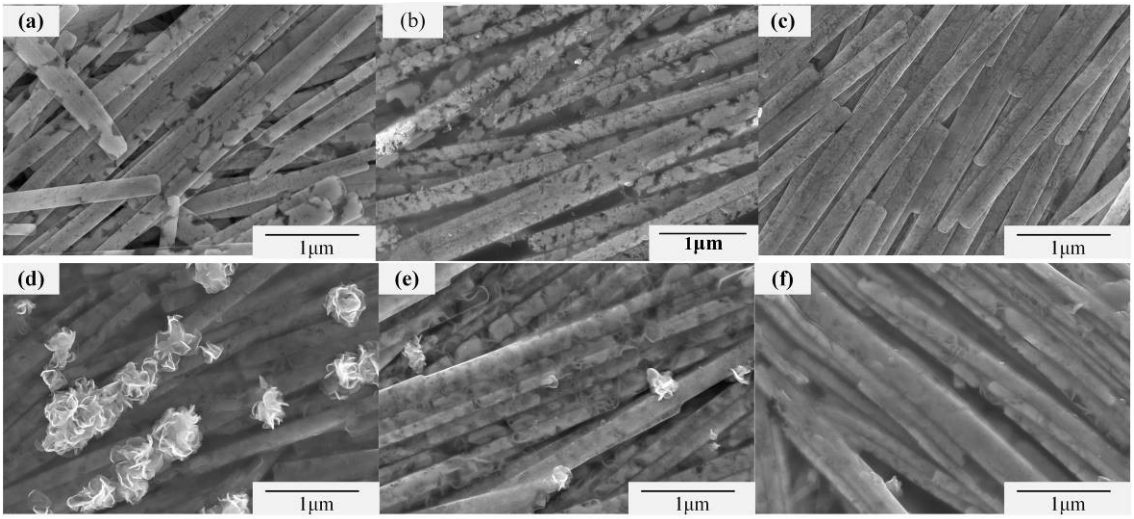

Fig.S4

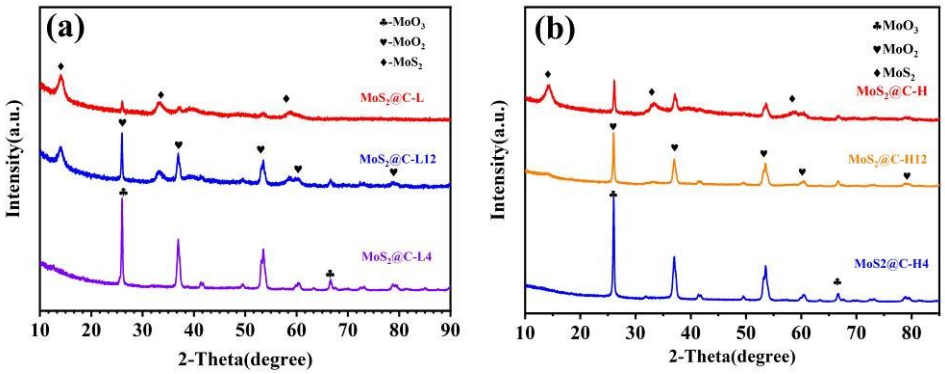
(a)
♣-MoO3
♥-MoO2
♦-MoS2
MoS2@C-L
MoS2@C-L12
MoS2@C-L4
Intensity(a.u.)
10 20 30 40 50 60 70 80 90
2-Theta(degree)
(b)
♣MoO3
♥MoO2
♦MoS2
MoS2@C-H
MoS2@C-H12
MoS2@C-H4
Intensity(a.u.)
10 20 30 40 50 60 70 80
2-Theta(degree)

Fig.S5

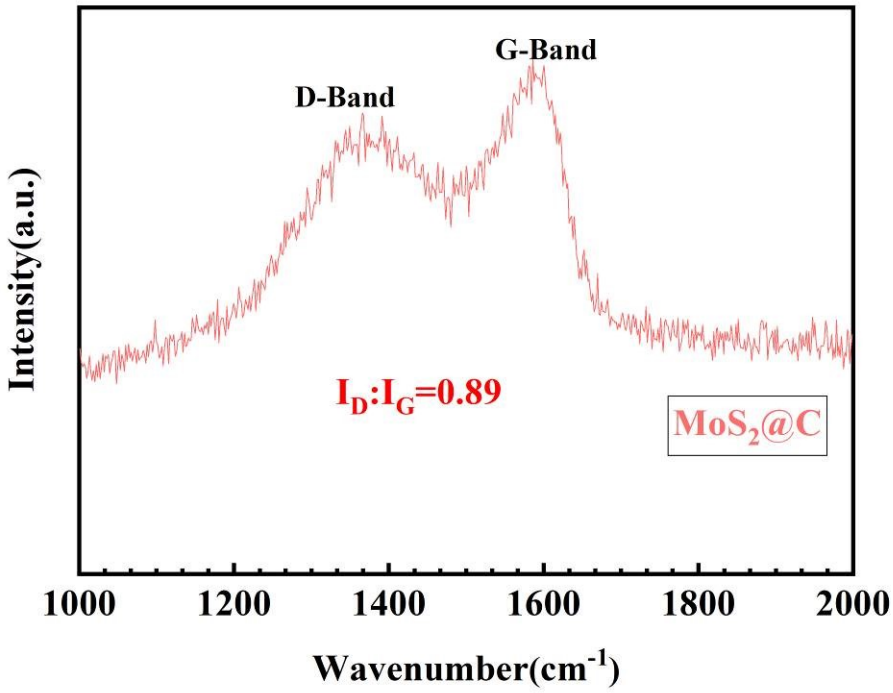
G-Band
D-Band
Intensity(a.u.)
I_D:I_G=0.89
MoS_2@C
1000
1200
1400
1600
1800
2000
Wavenumber(cm^{-1})

Fig.S6

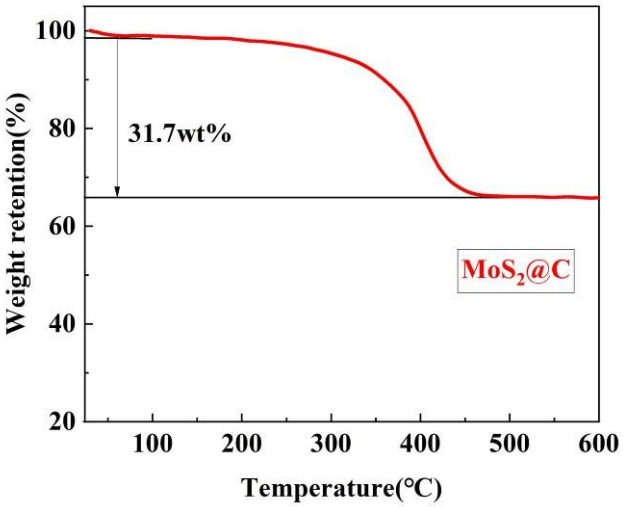
100
80
60
40
20
Weight retention(%)
31.7wt%
MoS2@C
100
200
300
400
500
600
Temperature(℃)

Fig.S7

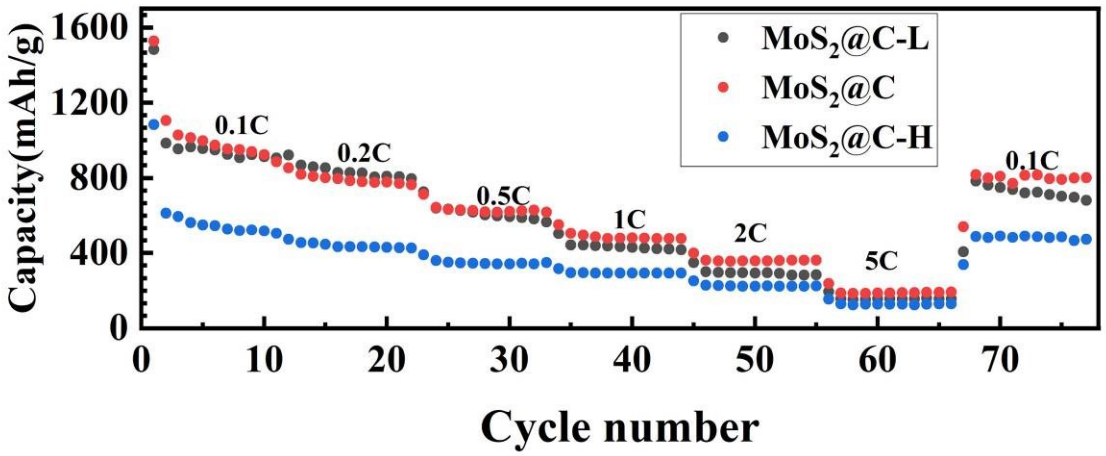
Capacity(mAh/g)
1600
1200
800
400
0
0
10
20
30
40
50
60
70
Cycle number
MoS2@C-L
MoS2@C
MoS2@C-H
0.1C
0.2C
0.5C
1C
2C
5C
0.1C

Fig.S8

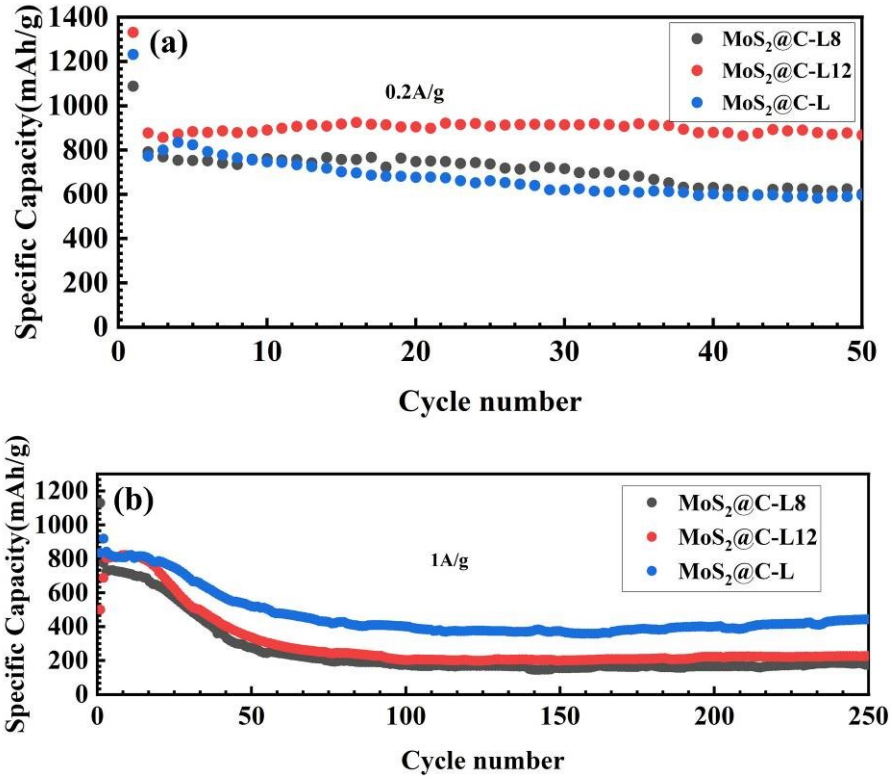
(a)
0.2A/g
MoS2@C-L8
MoS2@C-L12
MoS2@C-L
Specific Capacity(mAh/g)
Cycle number
(b)
1A/g
MoS2@C-L8
MoS2@C-L12
MoS2@C-L
Specific Capacity(mAh/g)
Cycle number

Fig.S9

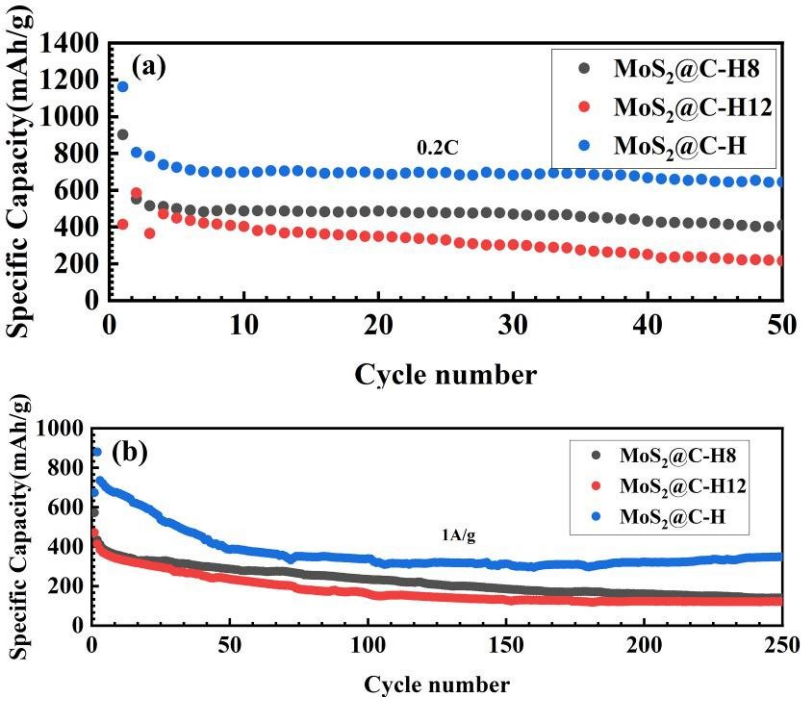
(a)
Specific Capacity(mAh/g)
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
Cycle number
0.2C
MoS2@C-H8
MoS2@C-H12
MoS2@C-H
(b)
Specific Capacity(mAh/g)
1000
800
600
400
200
0
0
50
100
150
200
250
Cycle number
1A/g
MoS2@C-H8
MoS2@C-H12
MoS2@C-H

Fig.S10

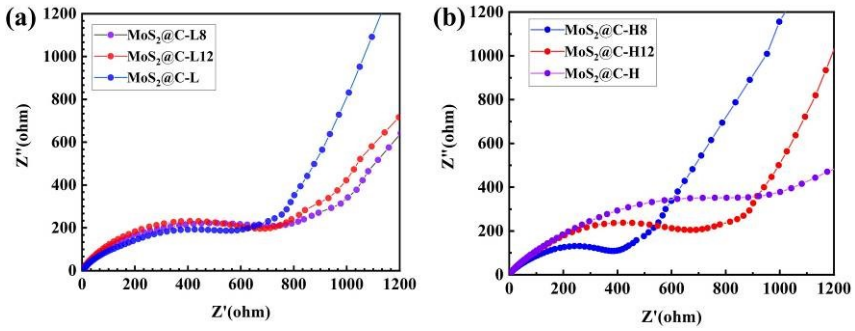
(a)
MoS2@C-L8
MoS2@C-L12
MoS2@C-L
Z''(ohm)
Z'(ohm)
0
200
400
600
800
1000
1200
(b)
MoS2@C-H8
MoS2@C-H12
MoS2@C-H
Z''(ohm)
Z'(ohm)

Fig.S11