Supporting Information

Freeze-Dried MoS_2 Sponge Electrodes for Enhanced Electrochemical Energy Storage

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SEM Images

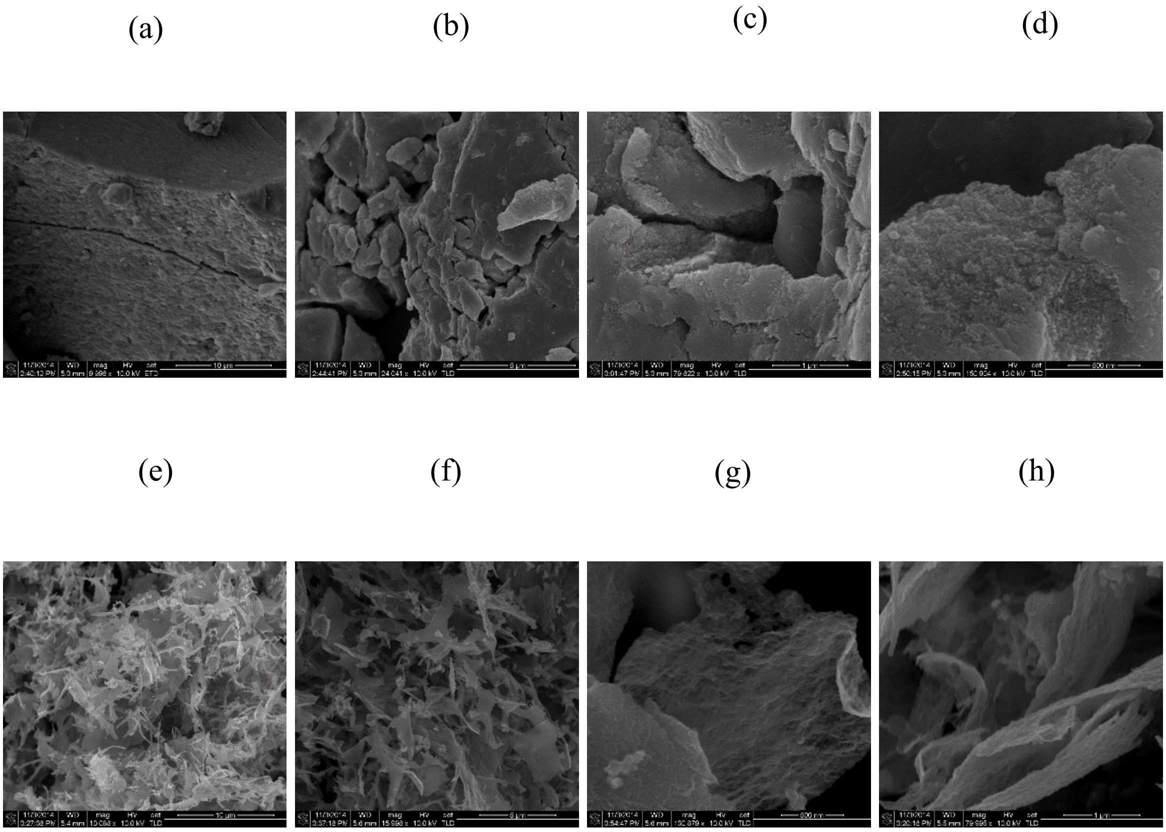
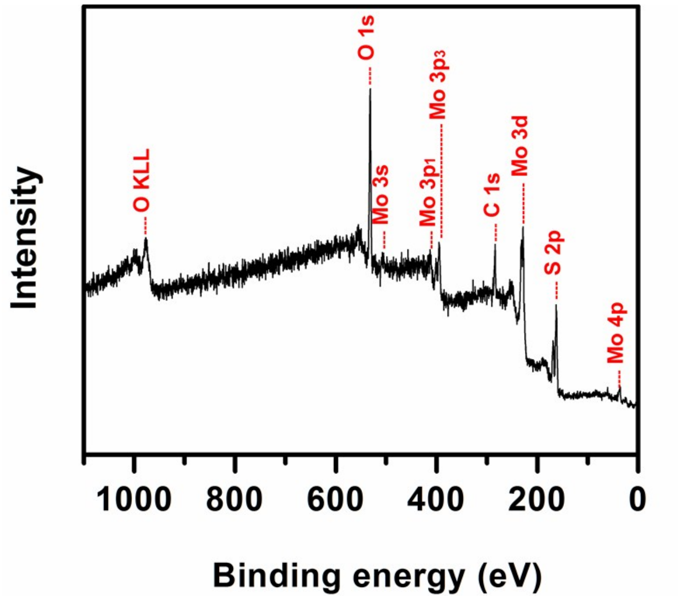


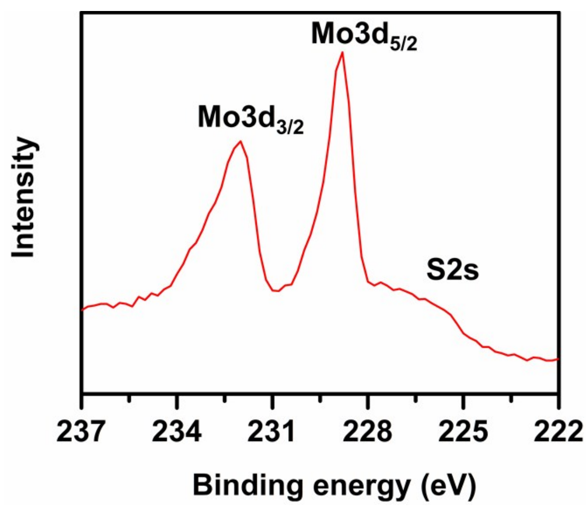
Figure S1. Scanning electron microscopic images of hydrothermally synthesized MoS_2 material. a-d) shows the various magnification of agglomerated MoS_2 microparticles obtained by normal air-drying method. e-f) displays various magnification of high surface area MoS_2 sponge electrodes obtained by freeze-drying method. For comparison purpose, almost same scale bar is used.

X-ray Photoelectron Spectra (XPS):

(a)



(b)



(c)

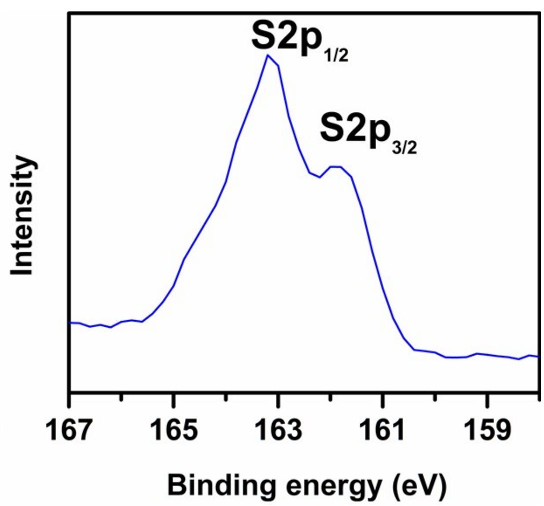


Figure S2. a) Survey spectrum of the freeze-dried MoS_2 sponge material. High resolution X-ray photoelectron spectra of (b) Mo 3d region and (c) S 2p region.

Table S1. Electrochemical performance comparison of freeze-dried MoS_2 sponge electrodes with other transition metal dichalcogenides.

Sl. No	Electrode material	Experimental Conditions	Specific capacitance	Specific capacitance of freeze-dried MoS_2 *	Ref.
1	Mesoporous MoS_2 nanostructure	CV-1 mV s^{-1}	403 F g^{-1}	510 F g^{-1} (CV-2 mV s^{-1})	1
2	MoS_2 nanowall films	CV-1 mV s^{-1}	100 F g^{-1}	510 F g^{-1} (CV-2 mV s^{-1})	2
3	MoS_2 monolayers	CV-1 mV s^{-1}	100 F g^{-1}	510 F g^{-1} (CV-2 mV s^{-1})	3
4	Flower-like MoS_2 nanospheres	CV-2 mV s^{-1}	114 F g^{-1}	510 F g^{-1}	4
5	Few-layered $MoSe_2$ nanosheets	CV-2 mV s^{-1}	199 F g^{-1}	510 F g^{-1}	5
6	Sphere like MoS_2 nanostructures	CV-5 mV s^{-1}	105 F g^{-1}	411 F g^{-1}	6
7	Metallic 1T phase MoS_2	CV-5 mV s^{-1}	250 F g^{-1}	411 F g^{-1}	7
8	2-D MoS_2	CV-5 mV s^{-1}	150 F g^{-1}	411 F g^{-1}	8
9	2-D rGO/MoS_2	CV- 5 mV s^{-1}	235 F g^{-1}	411 F g^{-1}	8
10	MoS_2-rGO nanocomposite	CV- 5 mV s^{-1}	416 F g^{-1}	411 F g^{-1}	9
11	Spherically clustered MoS_2 nanostructures	CV-5 mV s^{-1}	112 F g^{-1}	411 F g^{-1}	10
12	MoS_2 hierarchical Nanospheres	CV-5 mV s^{-1}	368 F g^{-1}	411 F g^{-1}	11
13	$MoSe_2$/rGO nanosheets	CV-5 mV s^{-1}	211 F g^{-1}	411 F g^{-1}	12
14	High concentration MoS_2/rGO	CV-10 mV s^{-1}	148 F g^{-1}	388.5 F g^{-1}	13
15	$MoSe_2$/rGO nanosheets	CV-10 mV s^{-1}	183 F g^{-1}	388.5 F g^{-1}	12
16	MoS_2 thin film	CV-10 mV s^{-1}	360 F g^{-1}	388.5 F g^{-1}	14
17	Exfoliated MoS_2 (using Me-Li)	GCD-0.5 A g^{-1}	18 F g^{-1}	120.2 F g^{-1}	15
18	Bulk MoS_2	GCD-0.5 A g^{-1}	2.5 F g^{-1}	120.2 F g^{-1}	16

19	Exfoliated MoS_2 sheets (using t-Bu-Li)	GCD-0.5 A g^{-1}	12 F g^{-1}	120.2 F g^{-1}	16
20	Bulk MoS_2	GCD-0.5 A g^{-1}	2.5 F g^{-1}	120.2 F g^{-1}	16
21	Exfoliated MoS_2 (using t-Bu-Li)	GCD-0.5 A g^{-1}	8 F g^{-1}	120.2 F g^{-1}	16
22	Bulk WS_2	GCD-0.5 A g^{-1}	2.5 F g^{-1}	120.2 F g^{-1}	16
23	Exfoliated WS_2 (using t-Bu-Li)	GCD-0.5 A g^{-1}	40 F g^{-1}	120.2 F g^{-1}	16
24	Bulk WSe_2	GCD-0.5 A g^{-1}	2.4 F g^{-1}	120.2 F g^{-1}	16
25	Exfoliated WSe_2 (using t-Bu-Li)	GCD-0.5 A g^{-1}	3 F g^{-1}	120.2 F g^{-1}	16
26	$MoSe_2$/rGO nanosheets	GCD-0.5 A g^{-1}	29 F g^{-1}	120.2 F g^{-1}	12

** - This Work, CV - cyclic voltammetry, GCD – Galvanostatic charge-discharge measurement, Me-Li – methyl lithium, and t-Bu-Li – tert-butyl lithium.*

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