Supporting information

Phosphoric acid-assisted synthesis of layered MoS_2/graphene hybrids with electrolyte-dependent supercapacitive behaviors

Bingqiao Xie[a], Ying Chen[a*], Mengying Yu[a], Shanshan Zhang[a], Luhua Lu[a*], Zhu Shu[a], Yong Zhang[b,c]

[a] *Engineering Research Center of Nano-Geomaterials of Ministry of Education, Department of Materials, China University of Geosciences, Wuhan 388 Lumo RD, Wuhan 430074, China*

[b] *School of Materials Science and Engineering, Hefei University of Technology, Hefei, 230009, China*

[c] *Key Laboratory of Advanced Functional Materials and Devices of Anhui Province, Hefei,230009, China*

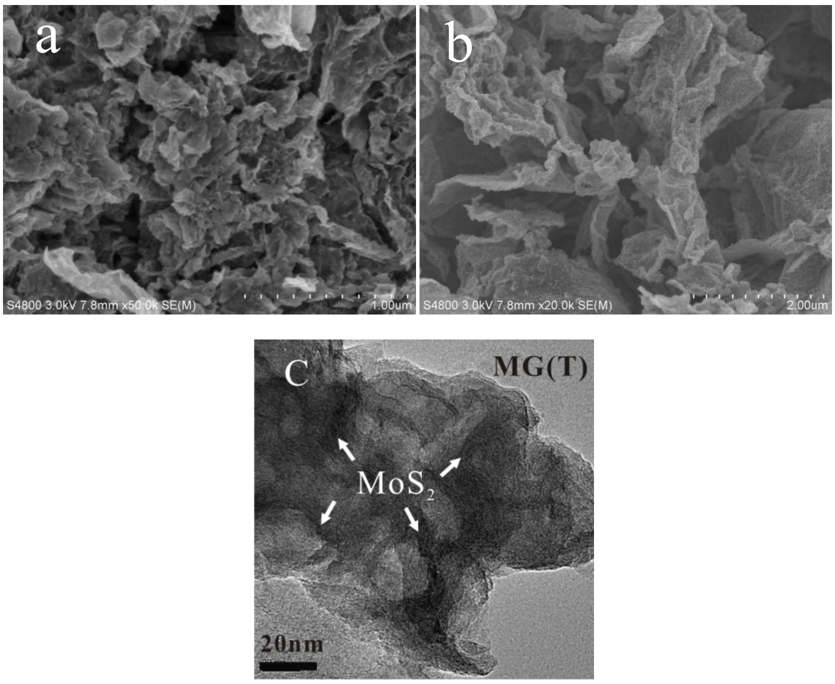

Figure S1. The additional SEM pictures of a) P-MG, b)P-MG(T), and c)TEM picture of MG(T).

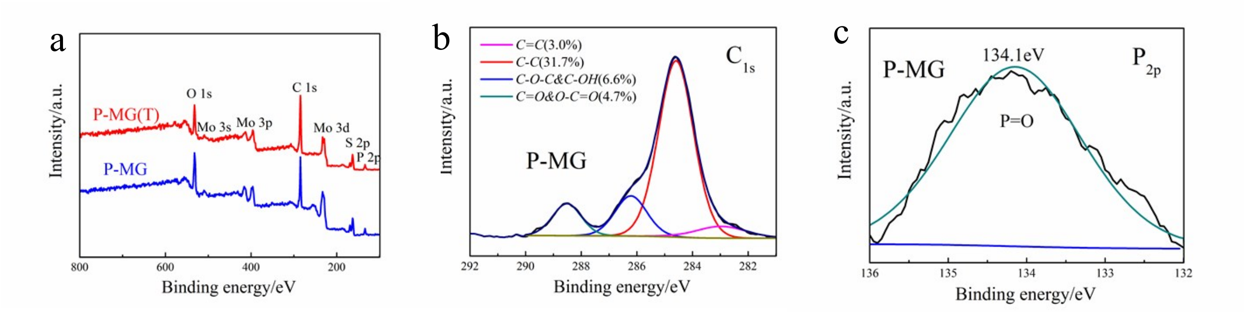

Figure S2. a) XPS survey spectra of P-MG and P-MG(T), b) C1s spectra of P-MG; c) P 2p spectra of P-MG.

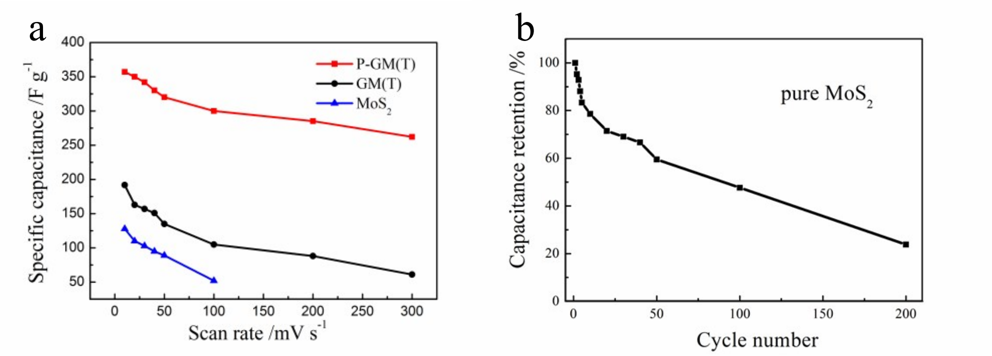

Figure S3. a)Calculated C_{sp} value for three samples from CV curves in acidic electrolyte; b)cycling performance of pure MoS_2.

Table S1. XPS analysis results and electrochemical properties of the samples.

Sample	XPS analysis(atom%)					C_{sp}(F g^{-1}) at 2A g^{-1}	
	C	O	P	S	Mo	6M KOH	1M H_2SO_4
MoS_2				67.5	32.5	36	42
MG	40.3	14.8		30.1	14.8		
MG(T)	45.3	9.5		30.3	14.9	172	164
P-MG	46	16.2	1.3	24.5	12.0		
P-MG(T)	50.9	12.1	1.1	24.1	11.8	258	351

Table S2. Electrochemical performance of MoS_2/graphene composite

Electrode materials	Involved precursors (preparation method)	Capacitance value(F/g)	Cycling retention	Electrolyte	Ref.
MoS_2-Gr	GO+Na_2MoO_4+L-cysteine (hydrothermal)	243(1A/g) 130(5A/g)	92.3%（1000 cycles 1A/g）	1M Na_2SO_4	1
MoS_2/RGO	GO+$(NH_4)_6Mo_7O_{24}$+NH_2CSNH_2 (hydrothermal)	249(0.3A/g) ~173(5A/g)	93.6%(1000 cycles 2A/g)	1M H_2SO_4	2
MoS_2/RGO	GO(DMF)+$MoCl_5$+butyl mercaptan (microwave)	205(80mV/s)	92%(1000 cycles CV data)	1M $HClO_4$	3
MoS_2-GNs	graphite+MoS_2 pellets (layer-by-layer)	255(2A/g)	93%(1000 cycles 1A/g)	1M Na_2SO_4	4
MoS_2/NG(1.5)	GO+Na_2MoO_4+L-cysteine (hydrothermal)	245(0.25A/g) 196(5A/g)	91.3%(1000 cycles 2A/g)	6M KOH	5
MoS_2/Carbon aerogel	Carbon aerogel+Na_2MoO_4+L-cysteine (hydrothermal)	260(1A/g) 179.9(10A/g)	92.4%(1500 cycles 1A/g)	1M Na_2SO_4	6
MoS_2/C composite	ammonium molybdate+ thiourea (hydrothermal)	201(0.2A/g)	89.4%(1000 cycles 0.2A/g)	1M Na_2SO_4	7
NC-MoS_2	Li_xMoS_2+dopamine hydrochloride (calcination)	158(0.5A/g)	89%(1000 cycles 1A/g)	1M Na_2SO_4	8
3D MoS_2/CMG	MoS_2 nanosheets+GO (hydrothermal)	268(0.5A/g)	93%(1000 cycles 1A/g)	1M Na_2SO_4	9
MoS_2/G nanocomposite	Thioacetamide+ammonium heptamolybdate+GO (hydrothermal)	270(0.1A/g)	89.6%(1000 cycles 0.6A/g)	1M Na_2SO_4	10
P-MG(T)	Na_2MoO_4 +*L*-cysteine +CTAB+H_3PO_4+GO (hydrothermal)	351(2A/g) 225(10A/g)	89.5%（1000 cycles 4A/g)	1M H_2SO_4	this work

References

[1] K.-J. Huang, L. Wang, Y.-J. Liu, Y.-M. Liu, H.-B. Wang, T. Gan and L.-L. Wang, *Int. J. Hydrogen Energ.,* 2013, **38**, 14027-14034.

[2] K. Gopalakrishnan, K. Pramoda, U. Maitra, U. Mahima, M.A. Shah and C.N.R. Rao, *Nanomaterials and Energy*, 2014. DOI: 10.1680/nme.14.00024.

[3] E.G. da Silveira Firmiano, A.C. Rabelo, C.J. Dalmaschio, A.N. Pinheiro, E.C. Pereira, W.H. Schreiner and E.R. Leite, *Adv. Energy Mater.,* 2014, **4**, 1301380.

[4] S. Patil, A. Harle, S. Sathaye and K. Patil, *Crystengcomm,* 2014, **16**, 10845-10855.

[5] B. Xie, Y. Chen, M. Yu, T. Sun, L. Lu, T. Xie, Y. Zhong and Y. Wu, *Carbon,* 2016, **99**, 35-42.
[6] K.-J. Huang, L. Wang, J.-Z. Zhang and K. Xing, *J. Electroanal. Chem.*, 2015, **752**, 33-40.
[7] L.-Q. Fan, G.-J. Liu, C.-Y. Zhng, J.-H. Wu and Y.-L. Wei, *Int. J. Hydrogen Energ.,*2015, **40**, 10150-10157.
[8] M. Yang, S.-K. Hwang, J.-M. Jeong, Y.S. Huh and B.G. Choi, *Synthetic Met.*, 2015, **209**, 528-533.
[9] M. Yang, J.-M. Jeong, Y.S. Huh and B.G. Choi, *Compos. Sci. Technol.*, 2015, **121**, 123-128.
[10] R. Thangappan, S. Kalaiselvam, A. Elayaperumal, R. Jayavel, M. Arivanandhan, R. Karthikeyan and Y. Hayakawa, *Dalton T.*, 2016, **45**, 2637-2646.