Supporting Information
Synthesis of P doped NiS as Electrode Material for Supercapacitors with Enhanced Rate Capability and Cycling Stability

Li'an Peng,[a] Yongxiao Tuo,[b] Yan Lin,[c] Cuiping Jia,[d] Shutao Wang,[e] Yan Zhou[a] and Jun Zhang [a,*]

[a] School of Materials Science and Engineering, China University of Petroleum (East China), Qingdao, 266580, China

[b] College of New Energy, China University of Petroleum (East China), Qingdao, 266580, PR China

[c] College of Energy Storage Technology, Shandong University of Science and Technology, Qingdao 266590, China

[d] College of Science, China University of Petroleum (East China), Qingdao, 266580, China

[e] College of Chemistry and Chemical Engineering, China University of Petroleum (East China), Qingdao, 266580, China

Corresponding authors:

Jun Zhang: Zhangj@upc.edu.cn

Table. S1. The lattice constant and unit cell volume of the prepared material.

	a (Å)	b (Å)	c (Å)	$Volume_{cell}$ ($Å^3$)
075-0613 (NiS)	3.42	3.42	5.3	53.7
NiS	3.4194	3.4194	5.3028	53.70
P-NiS	3.4253	3.4253	5.3268	54.12

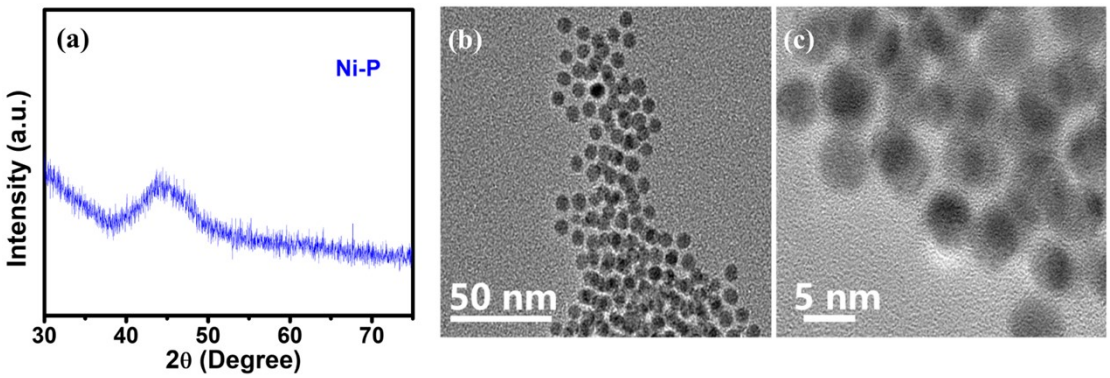

Fig. S1. (a) XRD pattern of Ni-P seeds; (b, c) TEM and HRTEM images of P-Ni seeds.

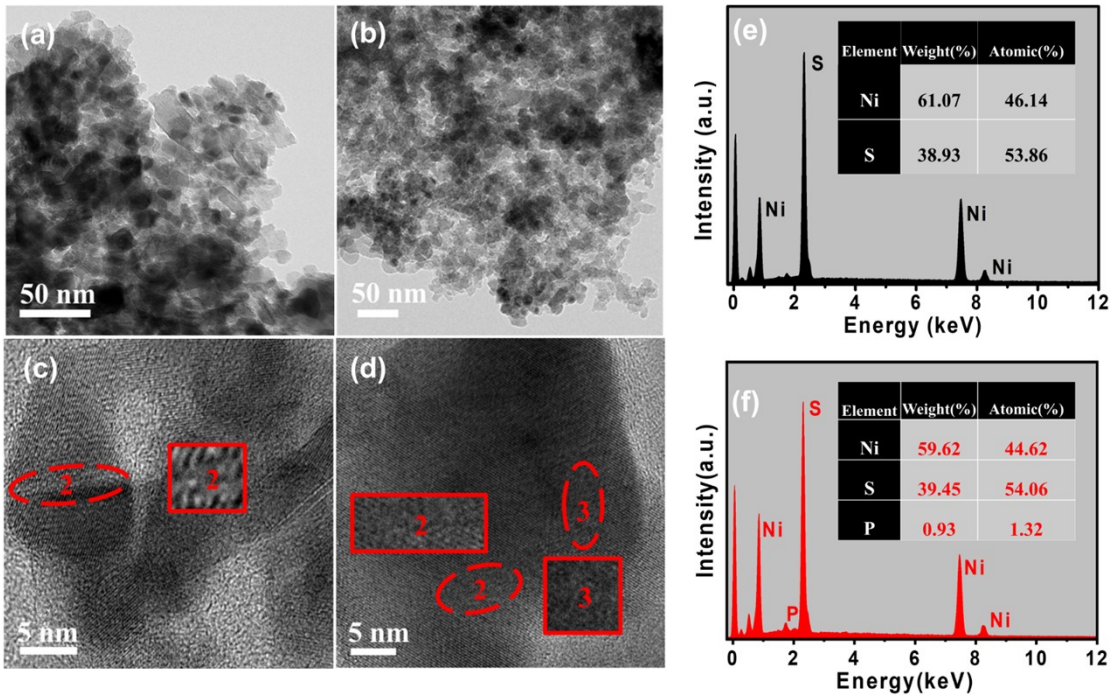

Fig. S2. (a) TEM image of NiS; (b) TEM image of P-NiS; (c, d) HRTEM images of P-NiS; (e) EDS spectrum of NiS; (f) EDS spectrum of P-NiS.

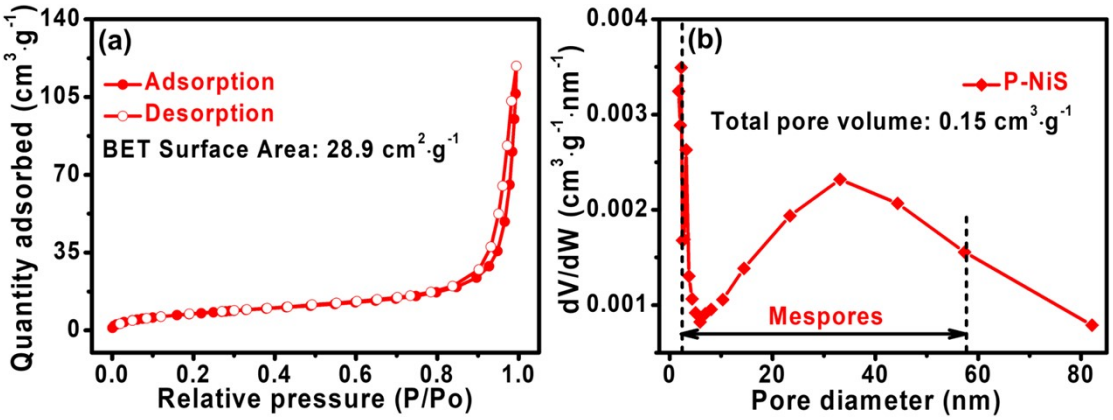

Fig. S3. (a) Nitrogen adsorption-desorption isotherms; (b) pore size distribution curves of P-NiS.

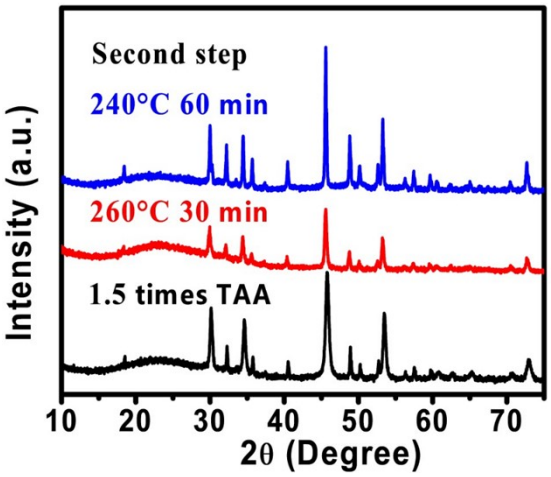

Fig. S4. XRD patterns of products obtained under different reaction conditions.

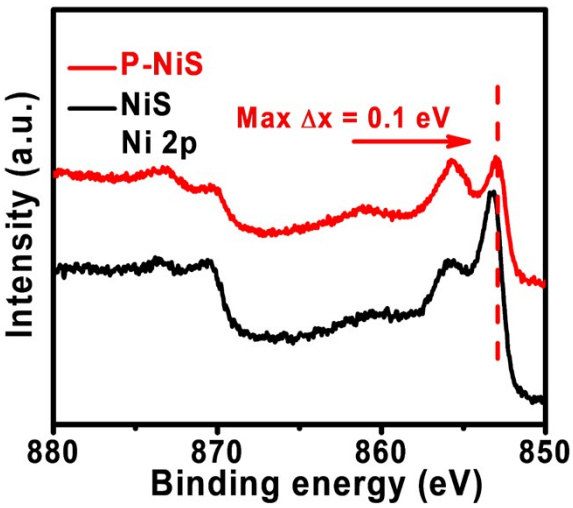

Fig. S5. High-resolution XPS of Ni 2p.

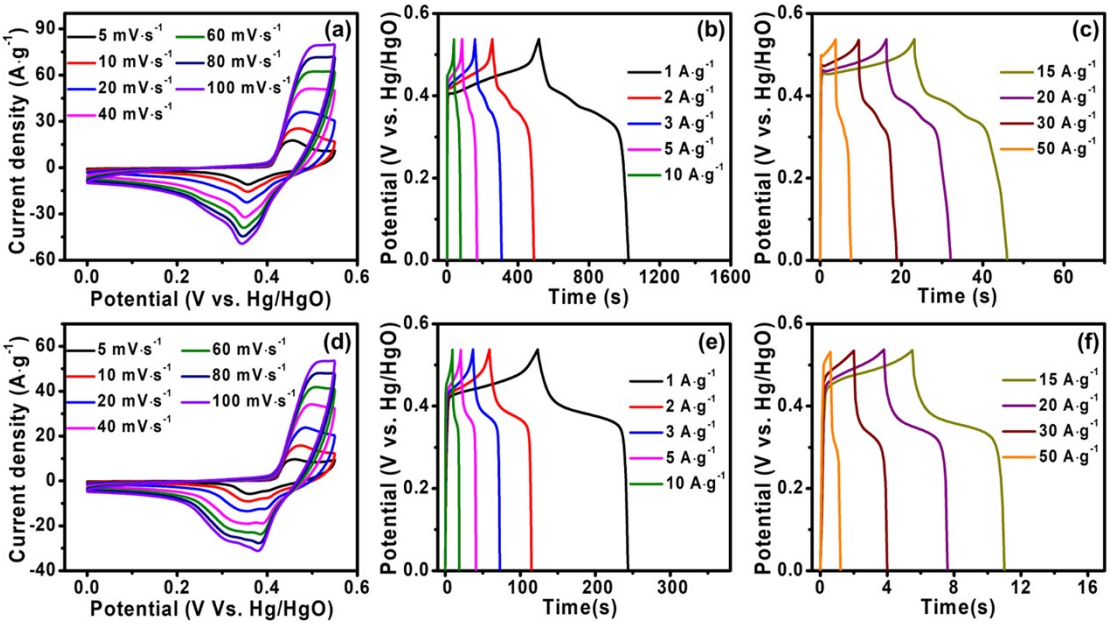

Fig. S6. (a) CV curves at different scan rates and (b, c) GCD curves at different densities of NiS; (d) CV curves at different scan rates and (e, f) GCD curves at different densities of Ni-P.

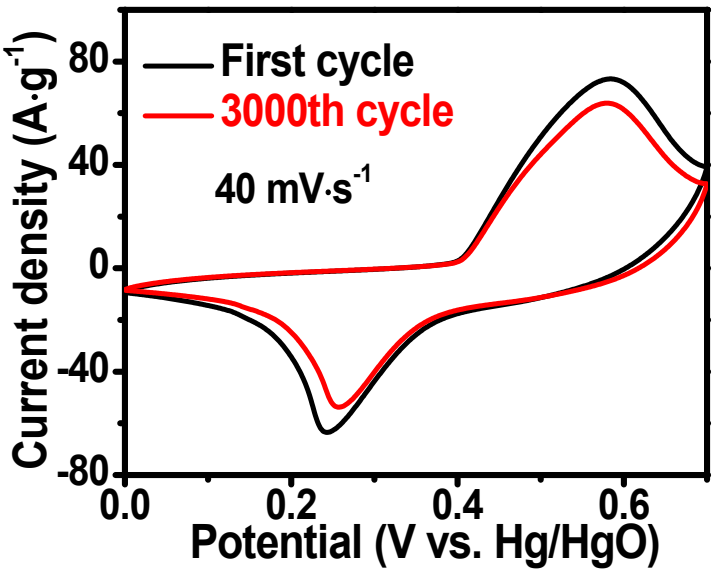

Fig. S7. CV comparison before and after stability test of P-NiS.

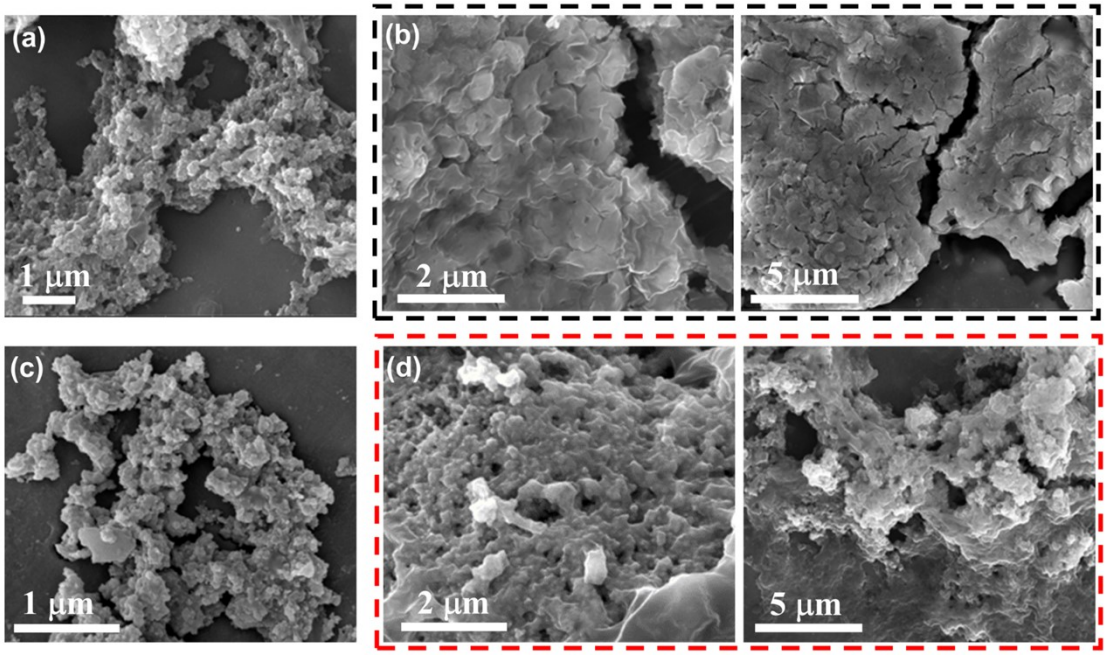

Fig. S8. (a, b) SEM images of the NiS electrode before and after cycle stability test; (c, d) SEM images of the P-NiS electrode before and after cycle stability test.

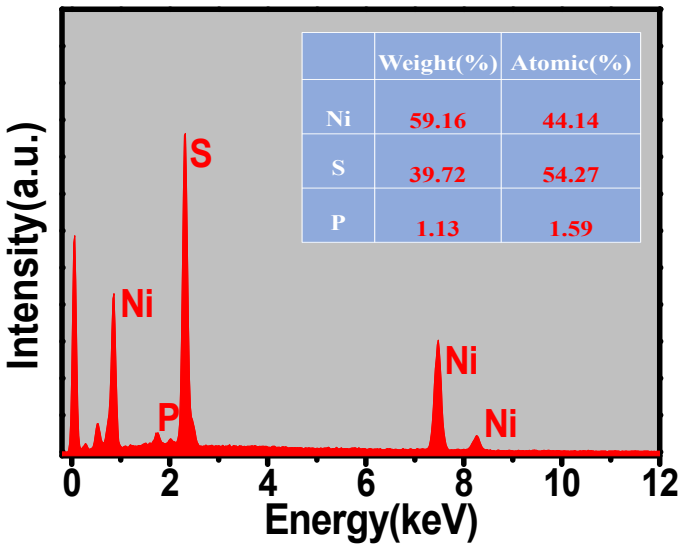

Fig. S9. EDS image of the P-NiS electrode after cycle stability test.

Table. S2. Comparison of electrochemical performance for NiS based electrode.

Materials	Electrolyte	Max. SC	Rate Performance	Cycling results	Refs.
NiS	2 MKOH	927 $F \cdot g^{-1}$/4.08 $A \cdot g^{-1}$	62.8%; 583 F g^{-1}/10.2 A g^{-1}	74.1%; 3000cycles/4.2 A g^{-1}	[1]
NiS	2 M KOH	857.76 $F \cdot g^{-1}$/2 $A \cdot g^{-1}$	59.8%; 512.96 $F \cdot g^{-1}$/5 A g^{-1}	40.7%; 1000cycles/2 A g^{-1}	[2]
NiS/CRs	2 M KOH	514 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	56.4%; 290 F g^{-1}/5 A g^{-1}	49.7%; 2000cycles/5 A g^{-1}	[3]
NiS/rGO	2 M KOH	905.3 $F \cdot g^{-1}$/0.5 $A \cdot g^{-1}$	63.95%; 579 F g^{-1}/5 A g^{-1}	90.9%; 2000cycles/4 A g^{-1}	[4]
NiS/GNS	6 M KOH	775 $F \cdot g^{-1}$/0.5 $A \cdot g^{-1}$	64.9%; 503 F g^{-1}/5 A g^{-1}	88.1%; 1000cycles/2 A g^{-1}	[5]
NiS	3 M KOH	717.3 $F \cdot g^{-1}$/0.6 $A \cdot g^{-1}$	17.5%; 125.4 F g^{-1}/6 A g^{-1}	98.5%; 1000cycles/1.2 A g^{-1}	[6]
NiS	6 M KOH	845 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	44%; 375 F g^{-1}/10 A g^{-1}	81.6%; 1000cycles/1 A g^{-1}	[7]
NiS	3 M KOH	1122.7 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	28%; 323.5 F g^{-1}/30 A g^{-1}	97.8%; 1000cycles/10 A g^{-1}	[8]
NiS/NHCS	2 M KOH	1150 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	52.2%; 600.3F g^{-1}/20 A g^{-1}	76%; 4000cycles/5 A g^{-1}	[9]
NiS	3 M KOH	1315.4 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	24.2%; 317.8 F g^{-1}/30 A g^{-1}	89.2%; 5000cycles/10 A g^{-1}	[10]
NiS	2 M KOH	515.98 $C \cdot g^{-1}$/1 $A \cdot g^{-1}$	37.6%; 194.01 $C \cdot g^{-1}$/50 $A \cdot g^{-1}$	76.7%; 3000cycles/30 $A \cdot g^{-1}$	This
P-NiS		727.79 $C \cdot g^{-1}$/1 $A \cdot g^{-1}$	50.6%; 368.26 $C \cdot g^{-1}$/50$A \cdot g^{-1}$	93.9%; 3000cycles/30 $A \cdot g^{-1}$	Work

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