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A Facile Design of Solution-Phase Based VS_2 Multifunctional Electrode for Green Energy Harvesting and Storage

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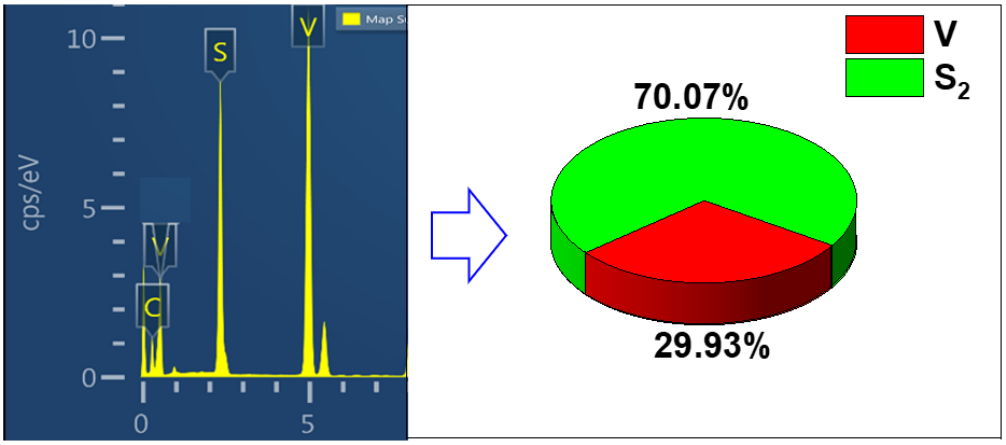

Figure S1. Energy-dispersive X-ray spectroscopy (EDX) analysis spectrum.

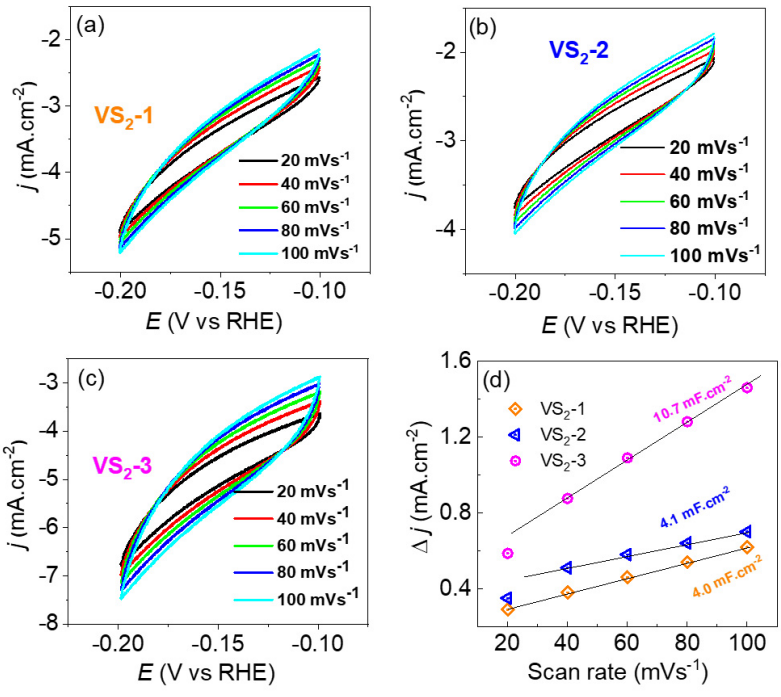

Figure S2. (a-c) Cyclic voltammetry (CV) curves of the VS_2-1, VS_2-2, VS_2-3 electrodes in the non-faradic region, and (d) their corresponding scan rate versus current density plots of the electrodes.

Table S1. EIS parameters extracted from Nyquist plots of the VS_2 samples.

Name	H_2O(S1)	EG(S2)	H_2O+EG (S3)
Rs(Ω)	1.980	2.102	1.870
Rct (Ω)	2.910	3.080	2.410
CPE(μF)	0.710	0.663	0.618
Z_W (Ω)	0.028	0.023	0.021

Table S2. Comparison of HER performance of the VS_2 -3 catalyst with the recently reported transition metal-based metal catalysts in acidic (0.5 M H_2SO_4) electrolyte.

No	Catalyst name	Electrolyte	Overpotential (mV) @ 10mAcm^{-2}	Reference
	VS_2 -3	0.5 M H_2SO_4	161	This work
1	SnS_2/NF	0.5 M H_2SO_4	232	*J Hazard Mater*, 417 (2021), p. 126105
2	VS4/rGO	0.1 M H_2SO_4	210	Dalton Trans., 2018,47, 13792-13799
3	CoS_2/rGO	0.5 M H_2SO_4	150	Nano Convergence, 2016, 3:5.
4	NiS_2/rGO	0.5 M H_2SO_4	200	Catalysis Communications, 2016, 85, 26
5	Annealed WS_2/CC	0.5 M H_2SO_4	250	J. Mater. Chem. A, 2015, 3, 131
6	VS_2/ZnS/CdS	0.5 M H_2SO_4	86	Nano Convergence (2016) 3:5
7	VS_2@MoS_2	0.5 M H_2SO_4	177	ACS Appl. Mater. Interfaces 2017, 9, 42139−42148
8	$V_{0.09}Mo_{0.91}S_2$	0.5 M H_2SO_4	240	Nanoscale 2014, 6, 8359−8367

Table S3. Comparison of HER performance of the VS_2 -3 catalyst with the recently reported transition metal-based metal catalysts in alkaline (1M KOH) electrolyte.

No	Catalyst name	Electrolyte	Overpotential (mV) @ 10mAcm^{-2}	Reference
	VS_2 -3	1M KOH	197	This work
1	VO-S/NF	1M KOH	165	*Applied Surface Science 423 (2017) 1090–1096*
2	Ni@C/Ni foam	1M KOH	270	*J. Mater. Chem. A* 4 (2016) 7297-7304.
3	$NiCo_2S_4$/carbon cloth	1M KOH	305	*Nanoscale* 7 (2015) 15122-15126.
4	NiFe layered double hydroxides/Ni foam	1M KOH	210	*Science* 345 (2014) 1593-1596.
5	NiFeS/NF	1M KOH	180	*J. Mater. Chem. A* 4 (2016) 16394-16402.

Table S4. EIS parameters extracted from Nyquist plots of the VS_2 samples.

Name	$R_s(\Omega)$	$R_{ct}(\Omega)$
VS_2-1	1.12	1.45
VS_2-2	0.46	1.12
VS_2-3	0.24	0.945