Electronic Supplementary Material (ESI) for Nanoscale.


# Three-Dimensional Graphene-Supported Nickel Disulfide Nanoparticles Promise Stable and Fast Potassium Storage

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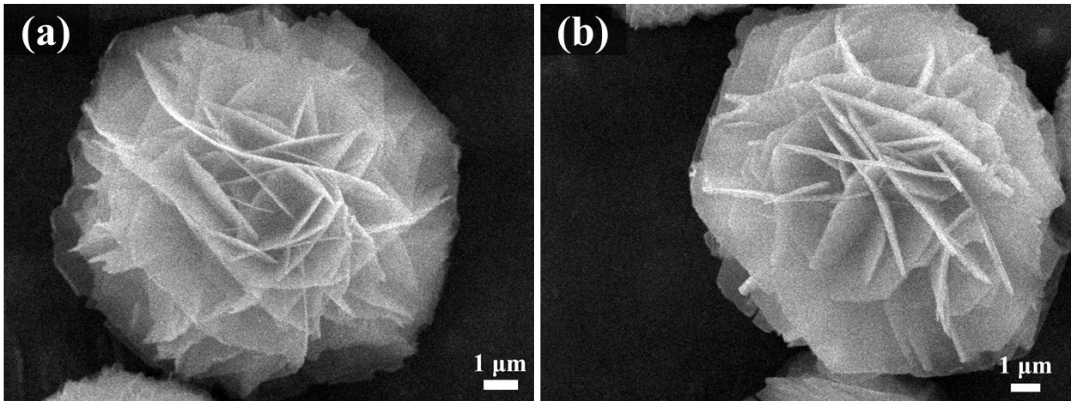


Figure S1. SEM images of nickel-based precursors; a) 6h, b)8h.

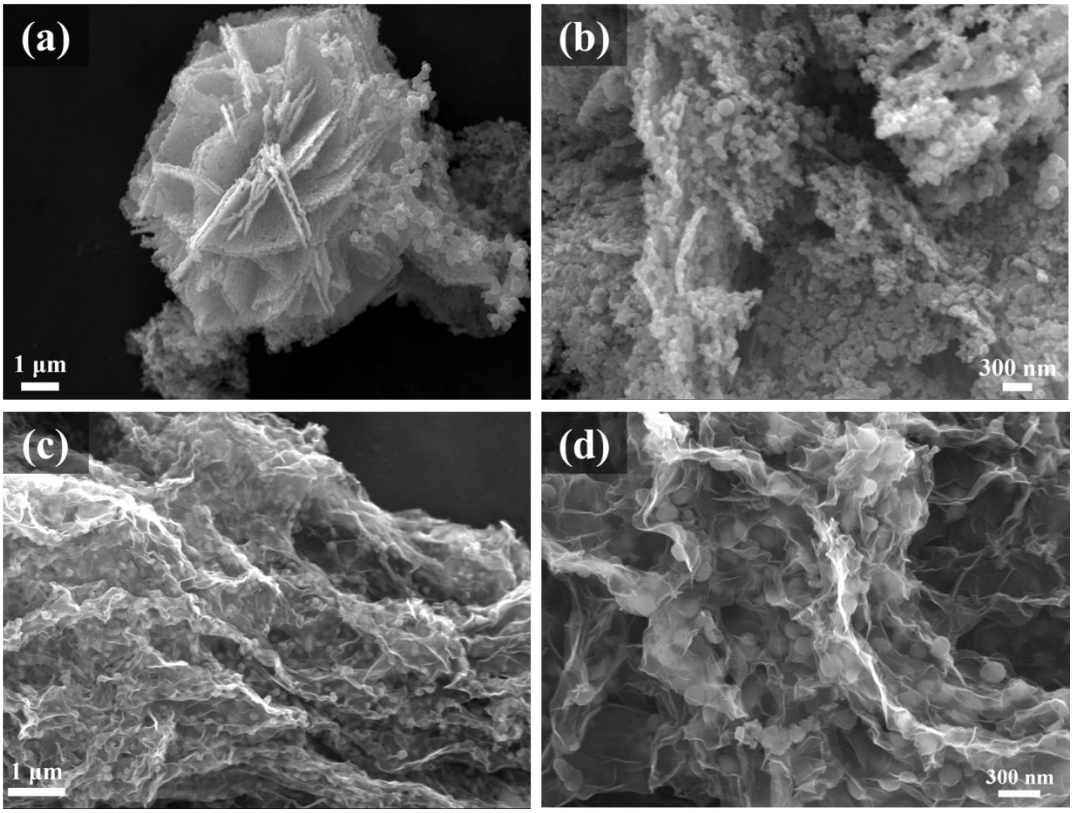


Figure S2. SEM images of a-b) $NiS_2$ microflowers and c-d) $NiS_2$/3DGO

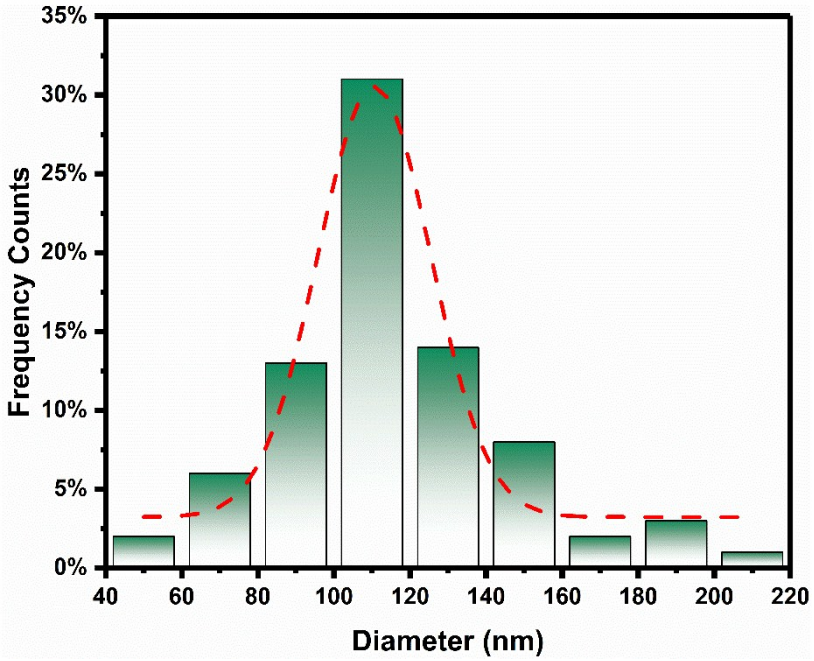


Figure S3. The particle-size distribution (PSD) of the $NiS_2$/3DGO

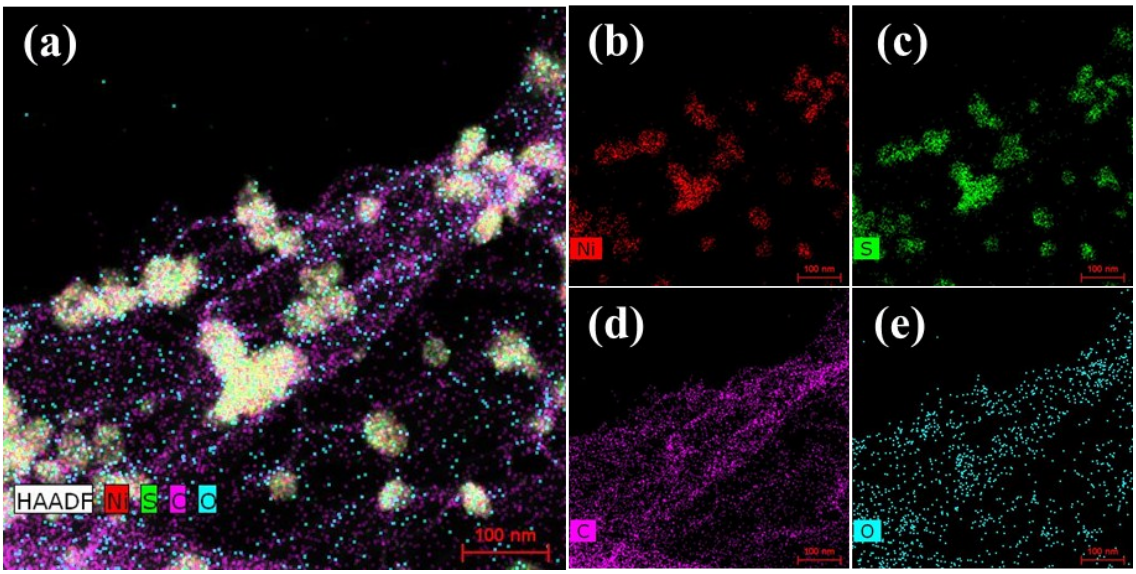


Figure S4. HAADF-STEM image of a) $NiS_2$/3DGO with EDS-mapping of b) Ni, c) S, d) C and e) O.

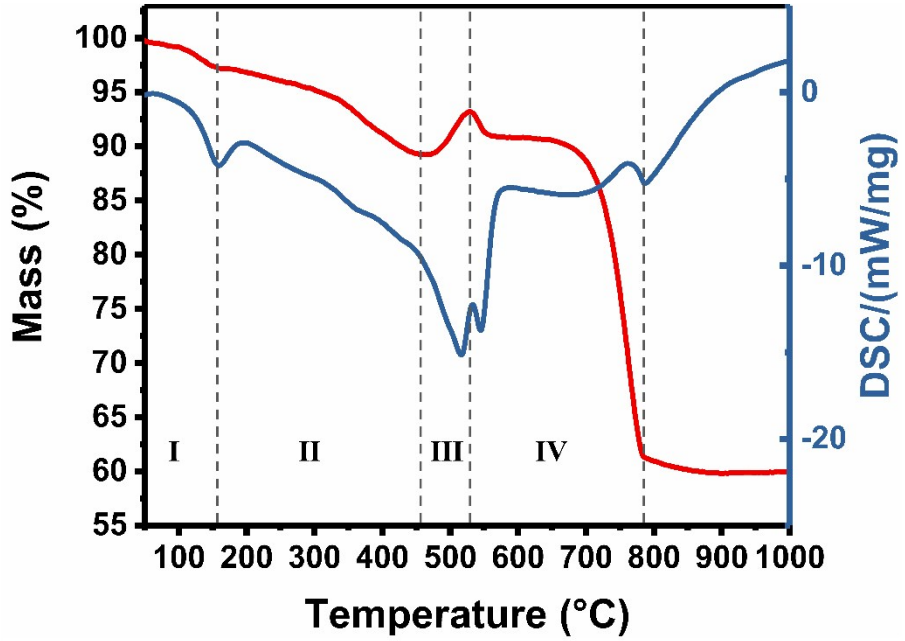


Figure S5. TG/ DSC curves of $NiS_2$/3DGO.

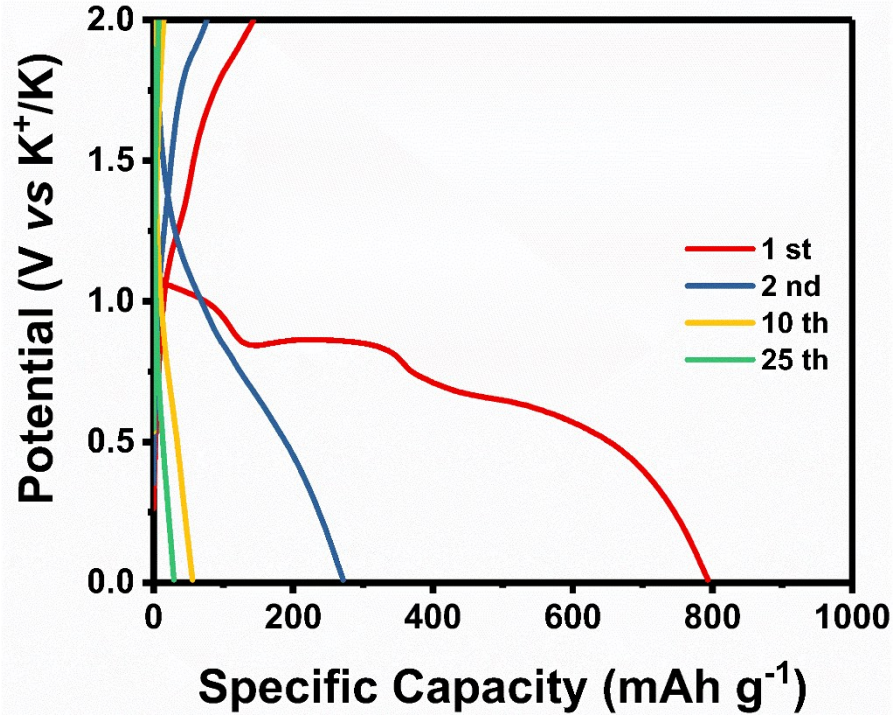


Figure S6. Representative galvanostatic charge–discharge curves of $NiS_2$ microflowers at 50 mA $g^{-1}$.

**Table S1. Electrochemical performance comparison of various K-ion anodes.**

| Anode Materials | Current Density ($mA\ g^{-1}$) | Capacity ($mA\ h\ g^{-1}$) | Cycles | Reference |
|---|---|---|---|---|
| $SnS_2$–rGO | 25 | 250 | 30 | ***Chem. Commun***., 2017, 53(59): 8272-8275. |
| $ReS_2$-N-CNFs | 50 | 253 | 100 | ***Nano Energy*** 2018, *45*, 346 |
| $Sn_4P_3$/C | 50 | 384 | 50 | ***J. Am. Chem. Soc.***, 2017, 139(9): 3316-3319 |
| $Sb_2S_3$/C | 50 | 500 | 50 | ***Nat. Commun.***, 2018, 9(1): 1-10 |
| $Sb_2Se_3$@C | 50 | 312.8 | 40 | ***J. Mater. Chem. A***, 2019, **7**, 12283-12291 |
| $MoS_2$/N-C | 50 | 330 | 50 | ***Adv. Funct. Mater.*** 2018, 1803409 |
| SnS2@C@rGO | 100 | 309 | 100 | ***ChemSusChem***, 2019, 12(12): 2689-2700. |
| $VSe_2$ | 100 | 366 | 200 | ***Adv. Mater.*** 2017, *29*, 1702061 |
| $NiS_2$@C@C | 50 | 302.7 | 100 | ***Adv. Funct. Mater***. 2019, 1903454 |
| $NiS_2$/3DGO | 50 | 451 | 50 | **This Work** |

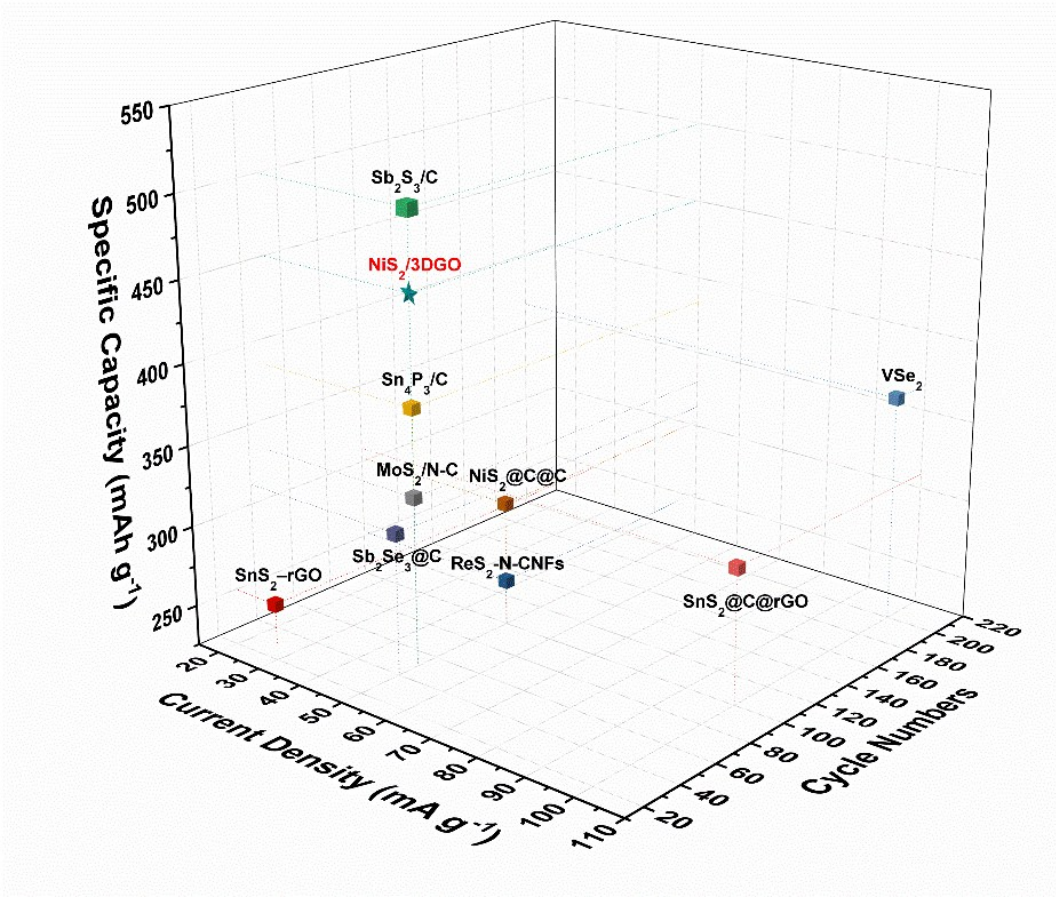


Figure S7. Summary of recent advances on electrode materials and methodologies for PIBs.

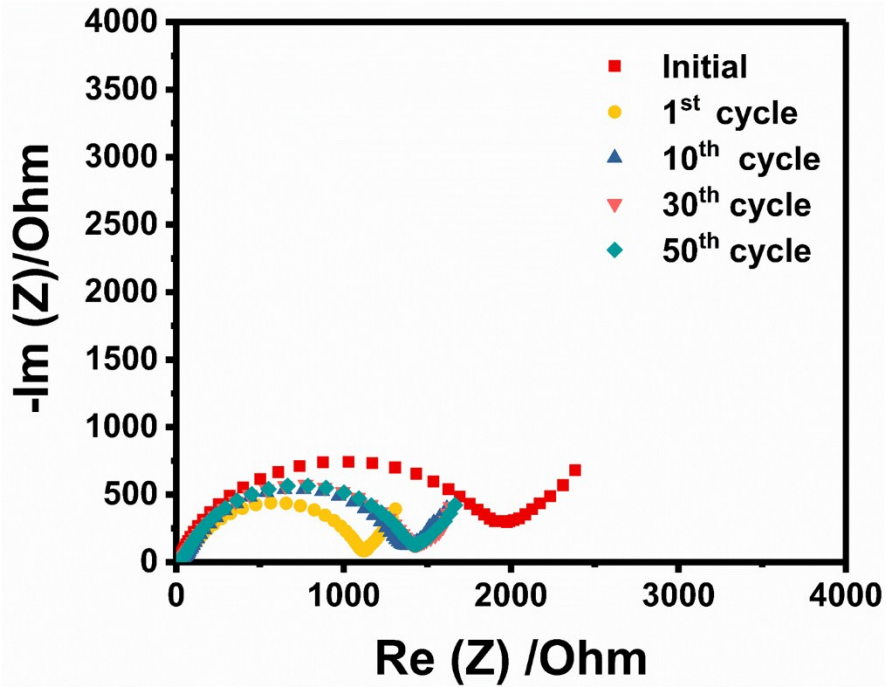


Figure S8. EIS curves after different number of cycles.

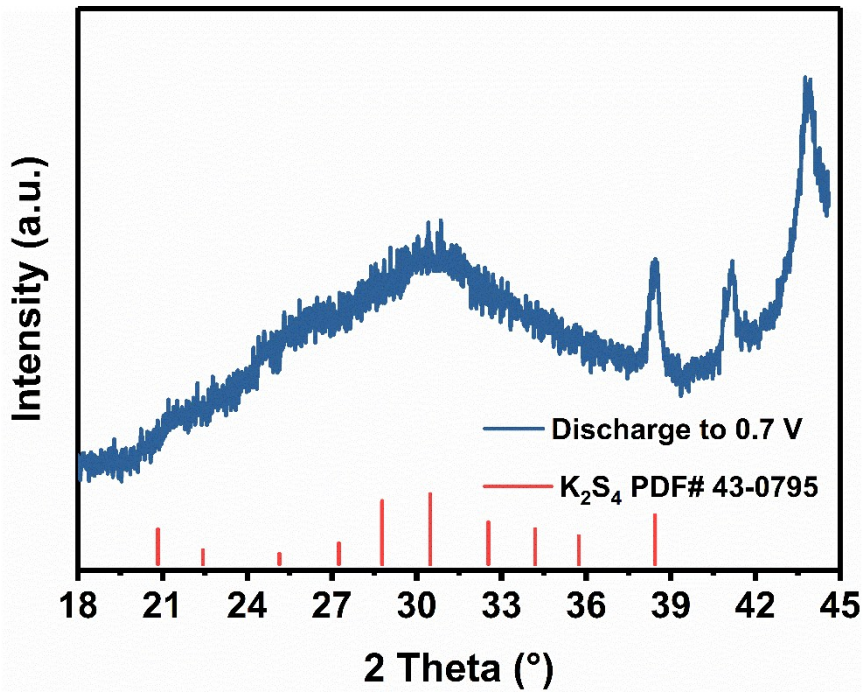


Figure S9. XRD pattern of $NiS_2$/3DGO when discharge to 0.8V