Electronic Supplementary Information

Enhancing the Cycle Stability of Na-Ion Batteries by Bonding SnS_2 Ultrafine Nanocrystals on Amino-Functionalized Graphene Hybrid Nanosheets

Yong Jiang,[a] Min Wei,[a] Jinkui Feng,[a] Yuchen Ma,[a] and Shenglin Xiong*[,a,b]

[a]Key Laboratory for Colloid and Interface Chemistry, Ministry of Education, and School of Chemistry and Chemical Engineering, Shandong University, Jinan 250100, P. R. China

[b]Institute of Physical Chemistry, Zhejiang Normal University, Jinhua 321004, P. R. China

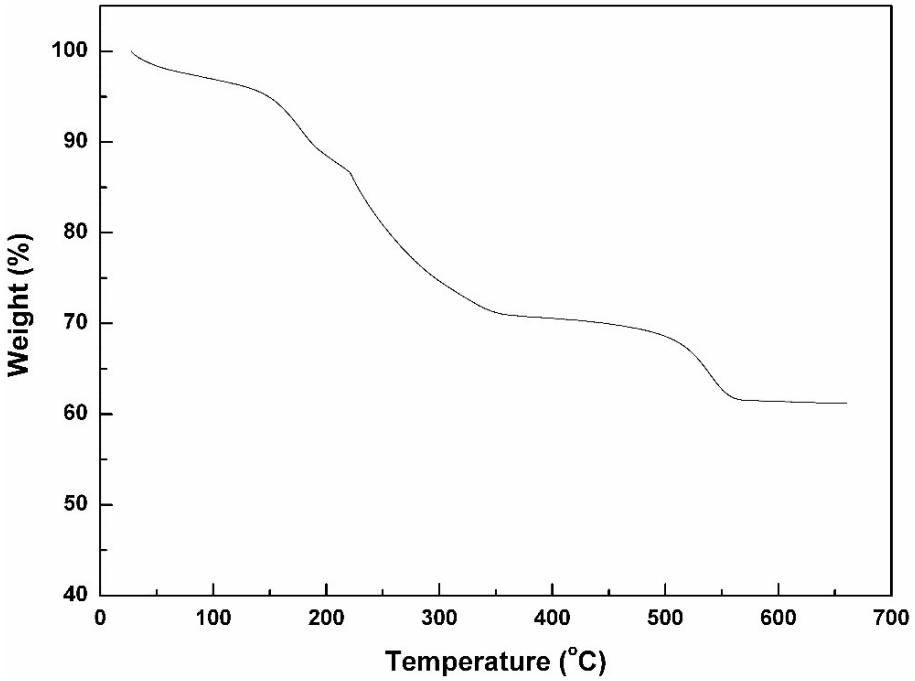

Figure S1. Thermogravimetric analysis of the as-synthesized SnS_2 NC/EDA-RGO hybrid nanosheets.

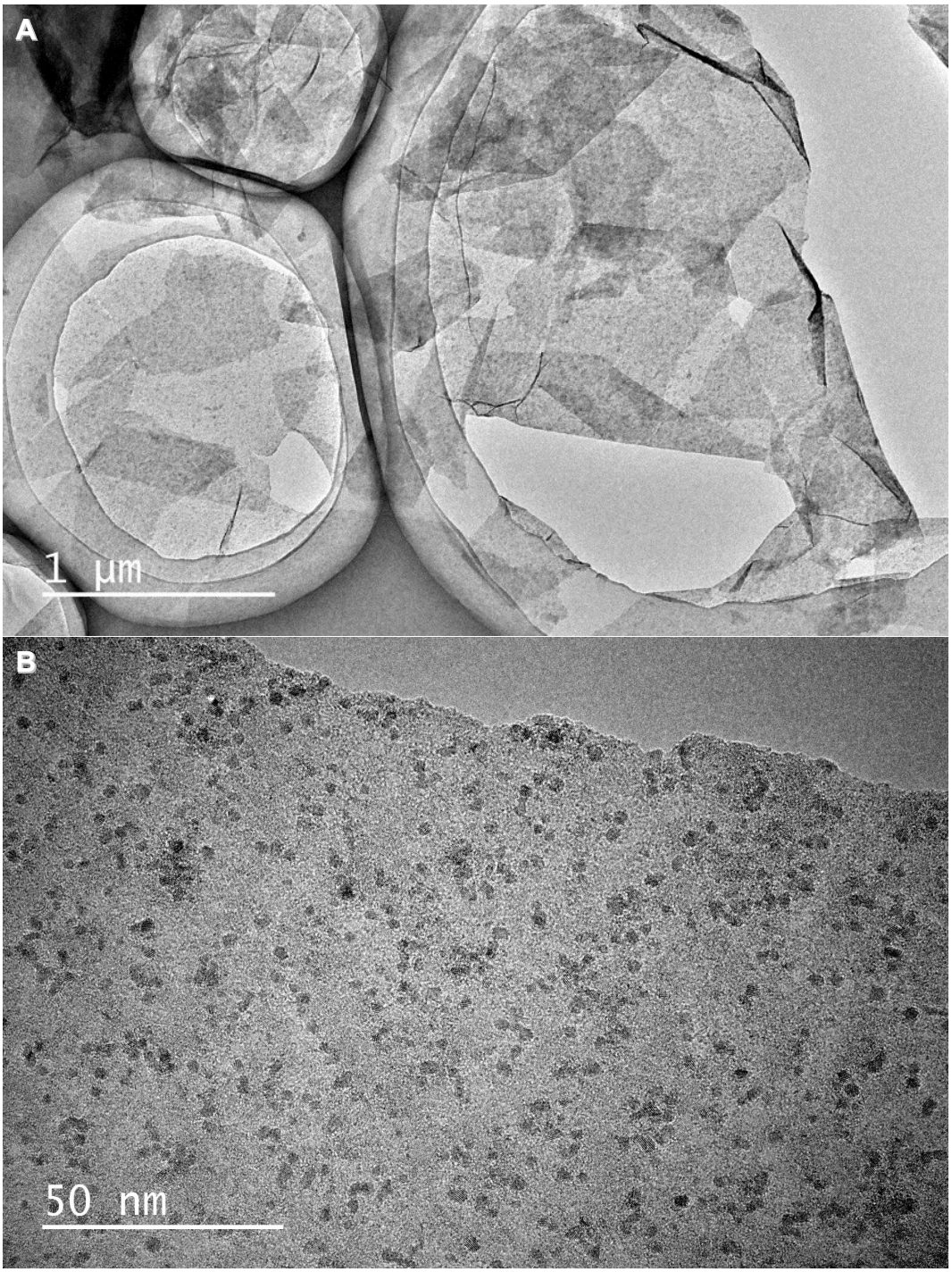

Figure S2. A,B) TEM (A) and high-magnification TEM (B) images of SnS_2 NC/EDA-RGO hybrid nanosheets.

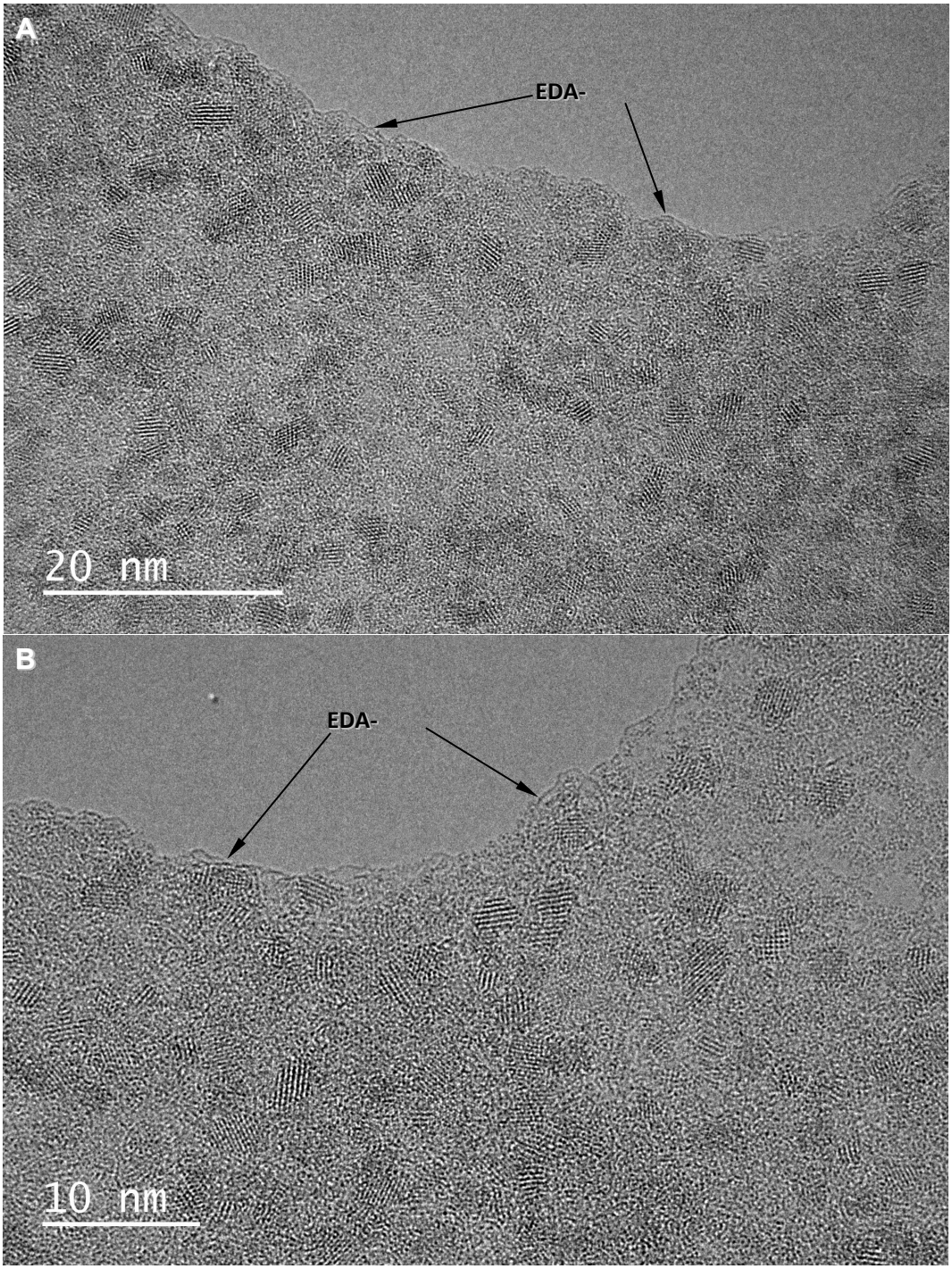

Figure S3. A,B) HRTEM images of SnS_2 NC/EDA-RGO hybrid nanosheets.

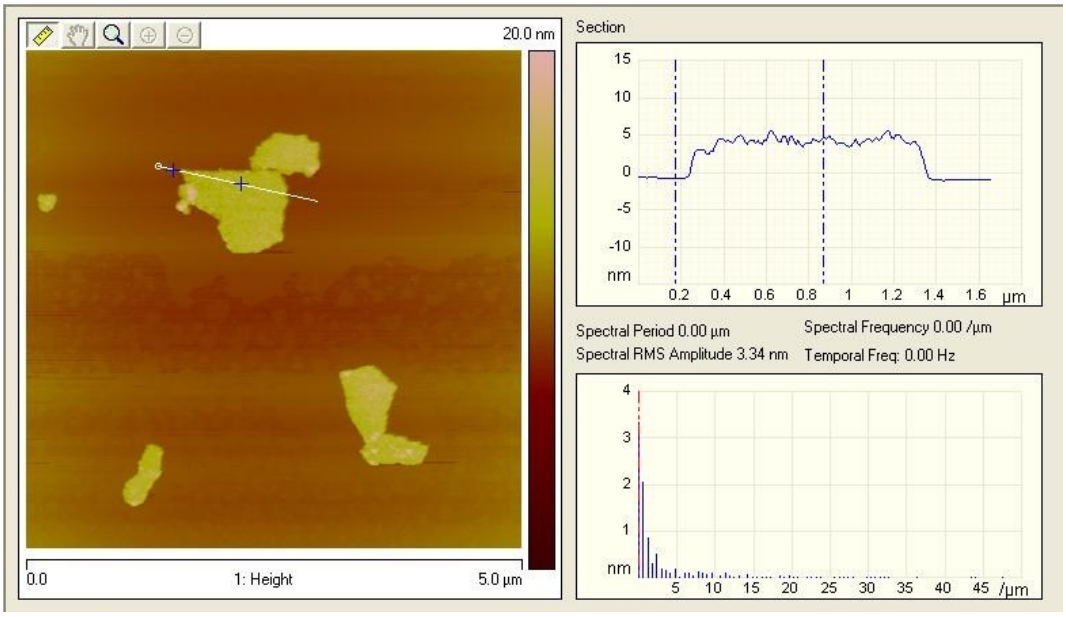

Figure S4. AMF image and height profile of SnS_2 NC/EDA-RGO hybrid nanosheets.

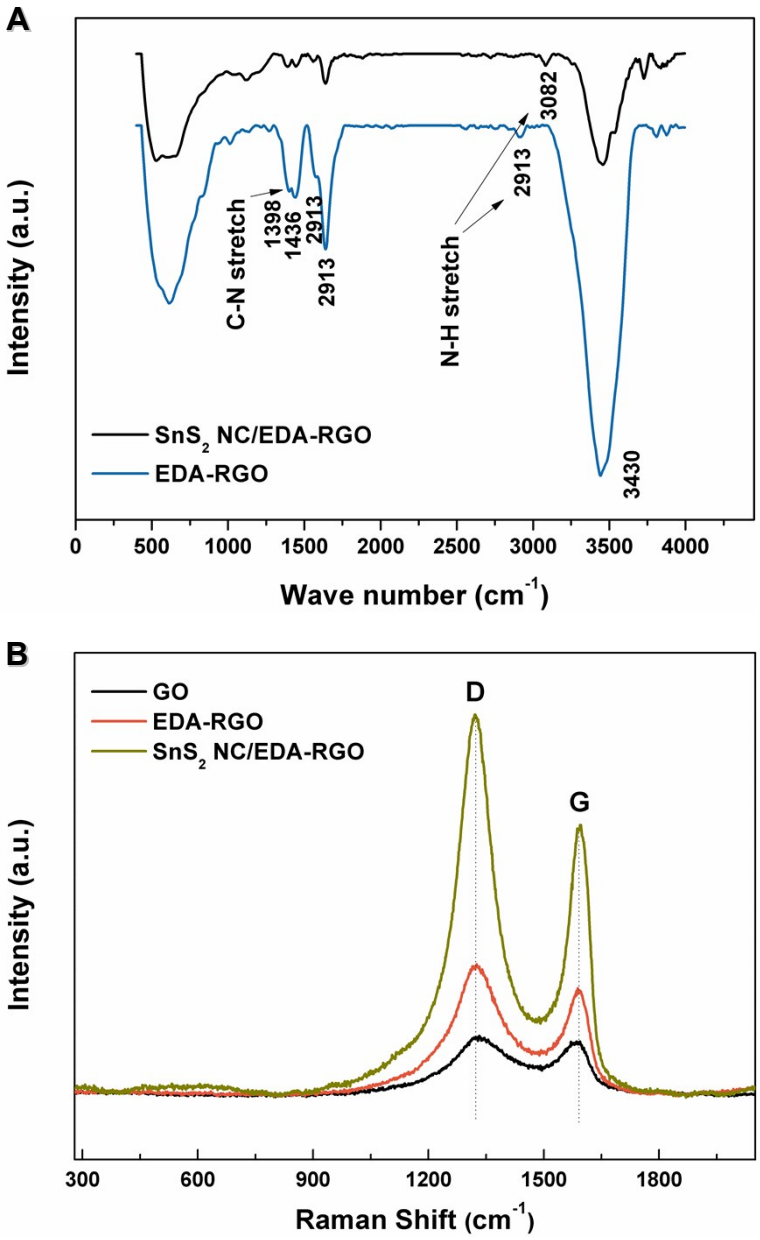

Figure S5. A) FT-IR spectra of EDA-RGO and SnS_2 NC/EDA-RGO hybrid nanosheets. B) Raman spectra of GO, EDA-RGO and SnS_2 NC/EDA-RGO hybrid nanosheets.

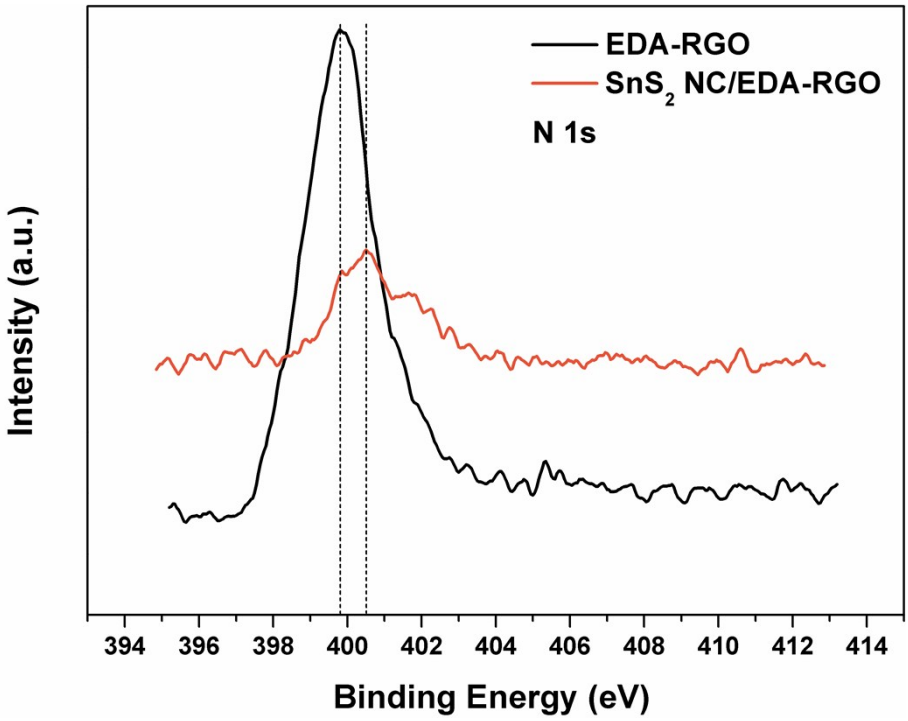

Figure S6. XPS spectra analysis. High-resolution N 1s spectra of EDA-RGO and SnS_2 NC/EDA-RGO hybrid nanosheets.

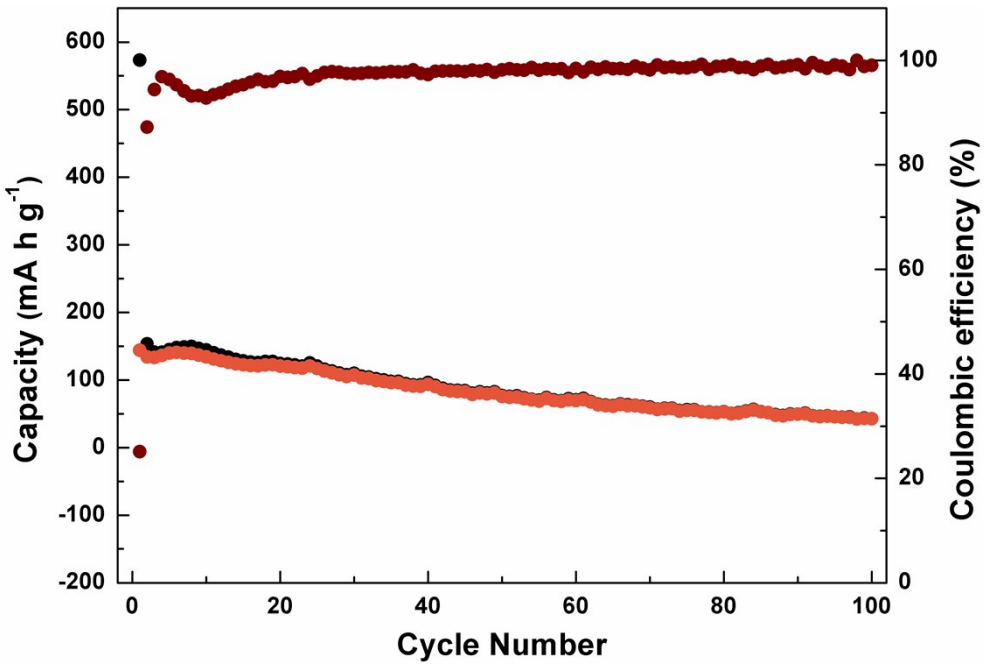

Figure S7. Cycling performance of pure SnS_2 nanoparticles at a current density of 200 mA g^{-1} and the corresponding Coulombic efficiency.

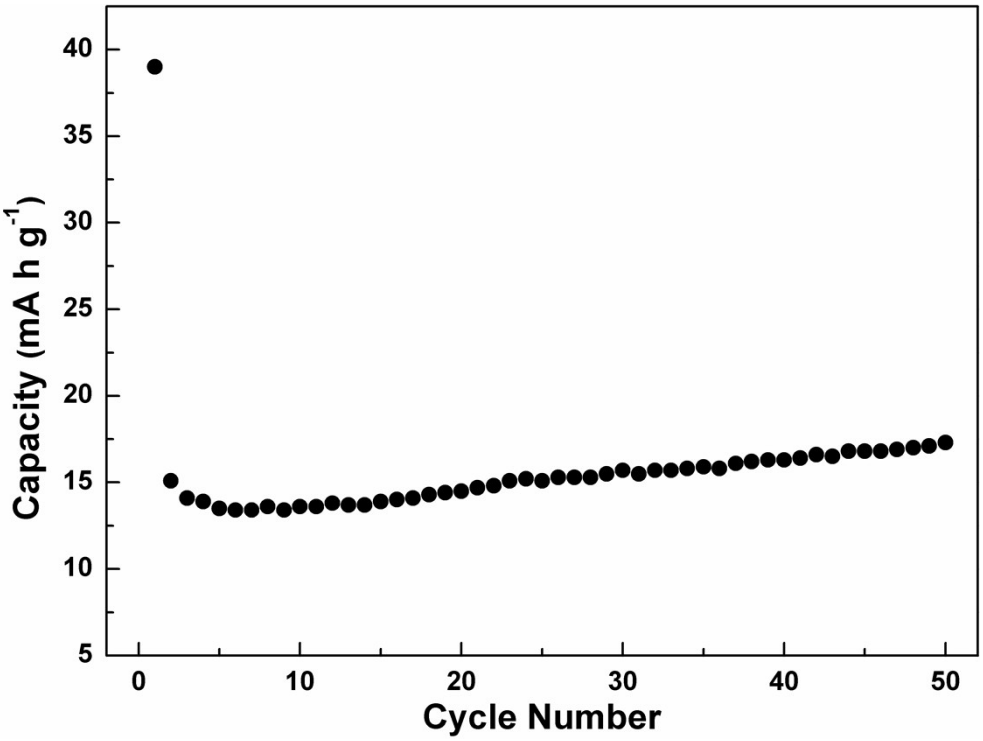

Figure S8. Cycling performance of the bare EDA-functionalized RGO electrode at a current density of 200 mA g^{-1}.

Table S1. Comparison of electrochemical performance of SnS_2 NC/EDA-RGO hybrid nanosheets in this work with those of others reported in the literature.

Sample	Current Density [mA g^{-1}]	Cycle number	Final capacity [mA h g^{-1}]	Capacity retention	Reference
SnS_2 NC/EDA-RGO	1000	400/1000	533/480	95%/85%	This work
SnS_2 NC/RGO	910	400/1000	485/256	84%/44%	This work
SnS_2-RGO	1000	400	500	84%	[15]
SnS_2/RGO	800	400/1000	417/286	89%/61%	[3]
SnS@Graphene	810	250	492		[14]
GO-SnS_2-300	500	150	450		[25]
WS_2@graphene	640	500	94		[12]
MG-3	320	300	227		[13]
MoS_2-carbon	1000	100	484		[17]
MoS_2/carbon	670	300	400		[18]

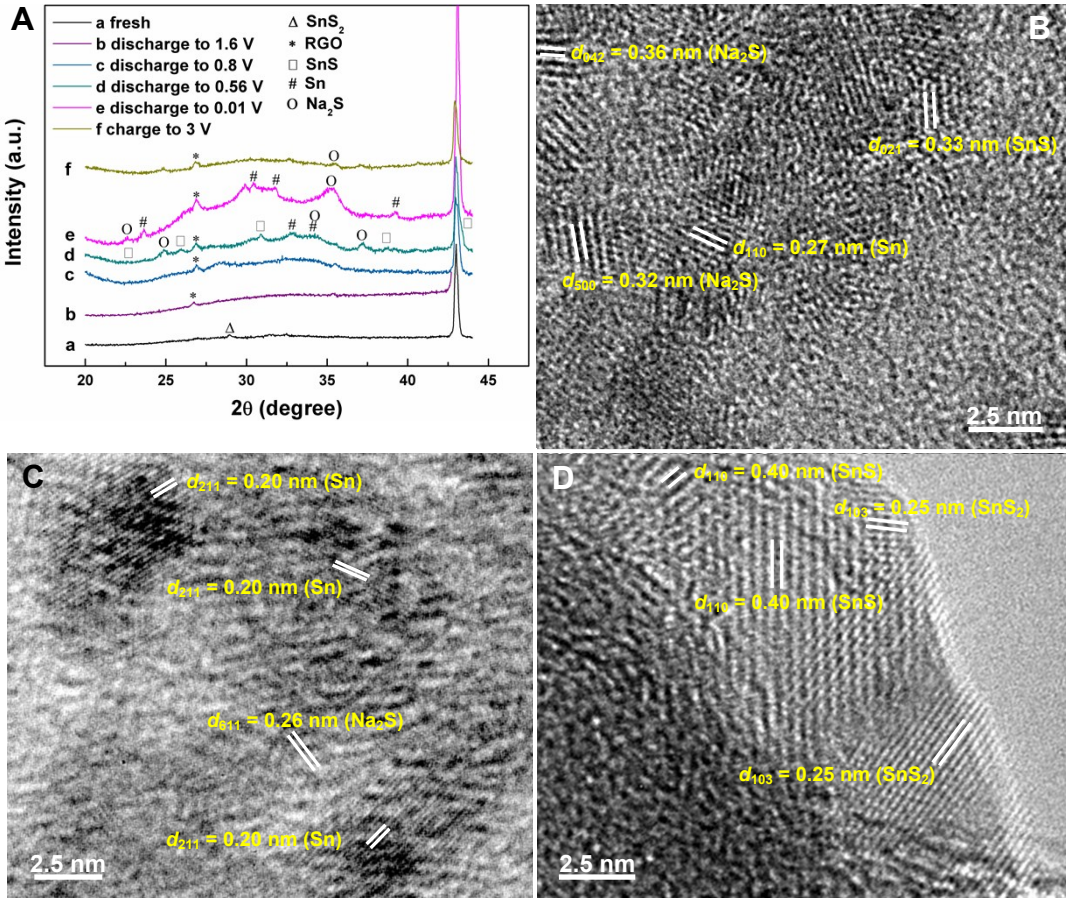

Figure S9. A) *Ex-situ* XRD patterns of SnS_2 NC/EDA-RGO electrodes tested under different discharge and charge state. *Ex-situ* HRTEM images of SnS_2 NC/EDA-RGO electrodes conducted after discharge to 0.56 V (B), after discharge to 0.01 V (C), after charge to 3.0 V (D).

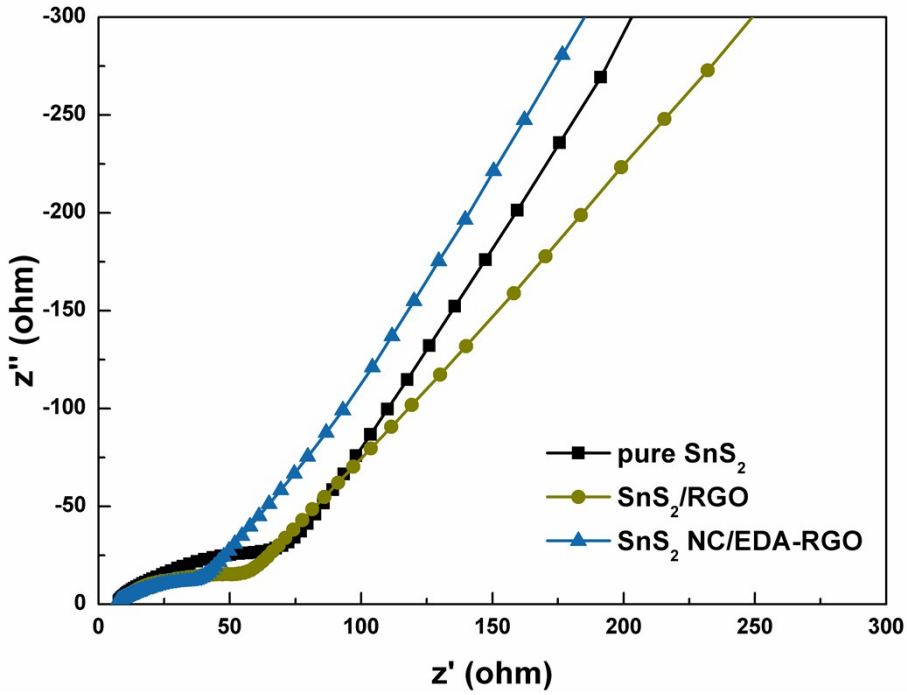

Figure S10. The electrochemical impedance spectra (EIS) of the pure SnS_2, SnS_2/RGO, and SnS_2 NC/EDA-RGO anodes after three cycles.

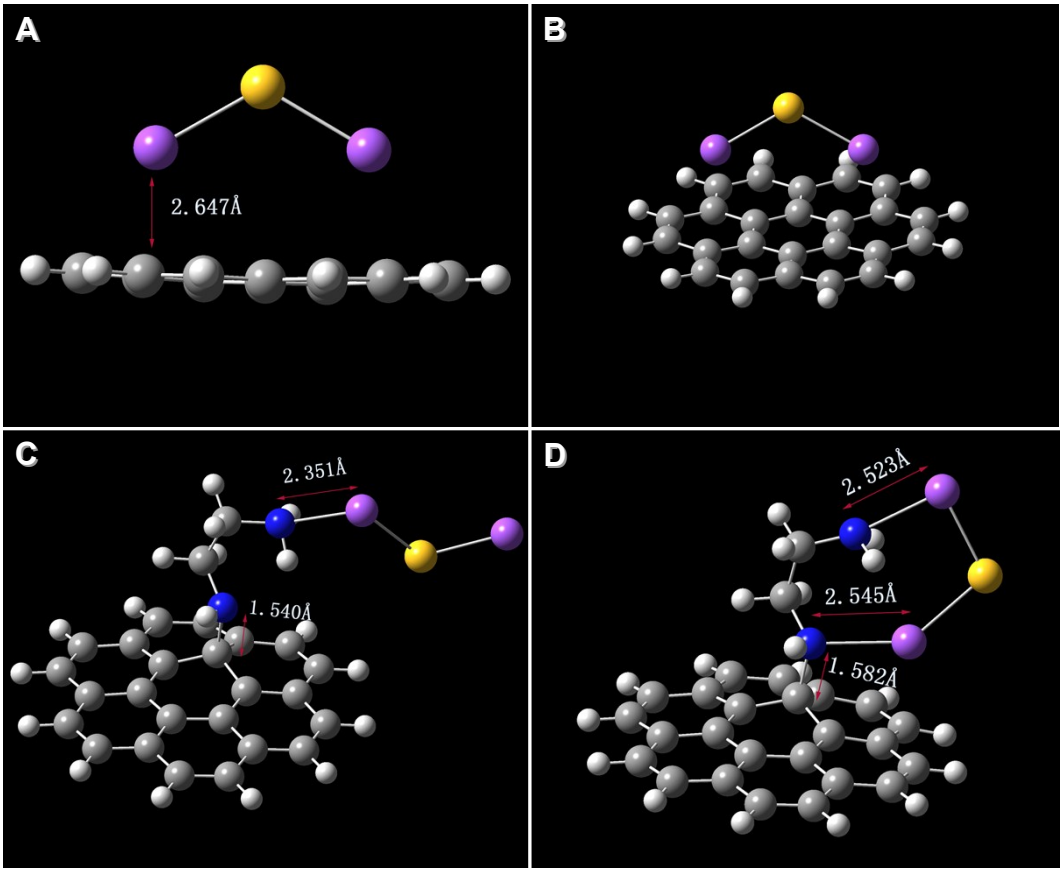

Figure S11. the models of VASP calculation, showing the interaction between Na_2S and pristine graphene (A,B), and EDA modified graphene (C,D). The carbon (C), sulphur (S), sodium (Na), hydrogen (H) and nitrogen (N) atoms are denoted as the gray, yellow, purple, white and blue spheres respectively.