Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information

A facile electrochemical strategy for engineering the sulfur deficiencies of CdS Nanosheets to promote catalytic conversion of polysulfides for lithium sulfur batteries

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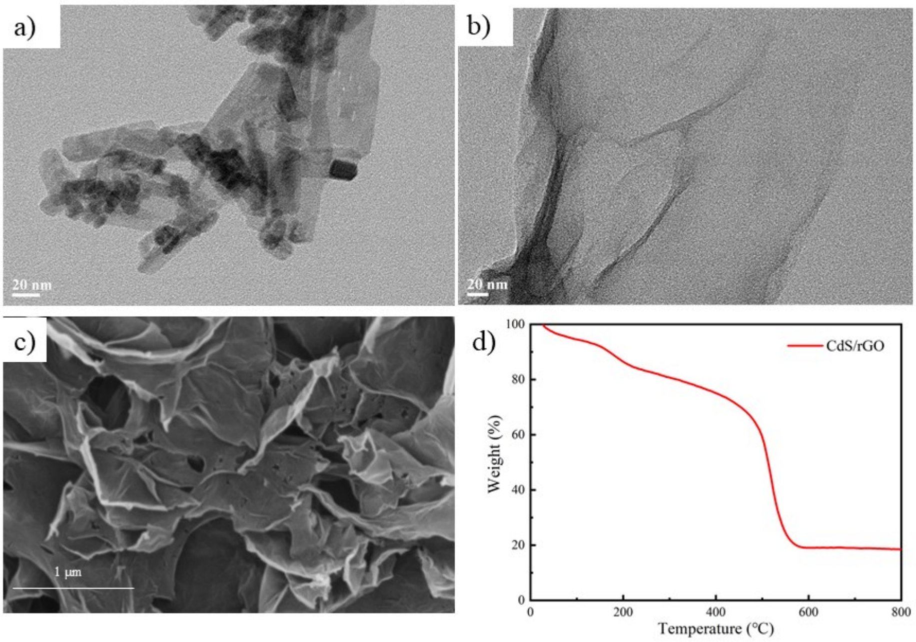

Fig. S1. a) TEM image of CdS NSs. TEM b) and SEM c) images of a thin GO film. d) TGA curve of CdS NSs/rGO composite in air.

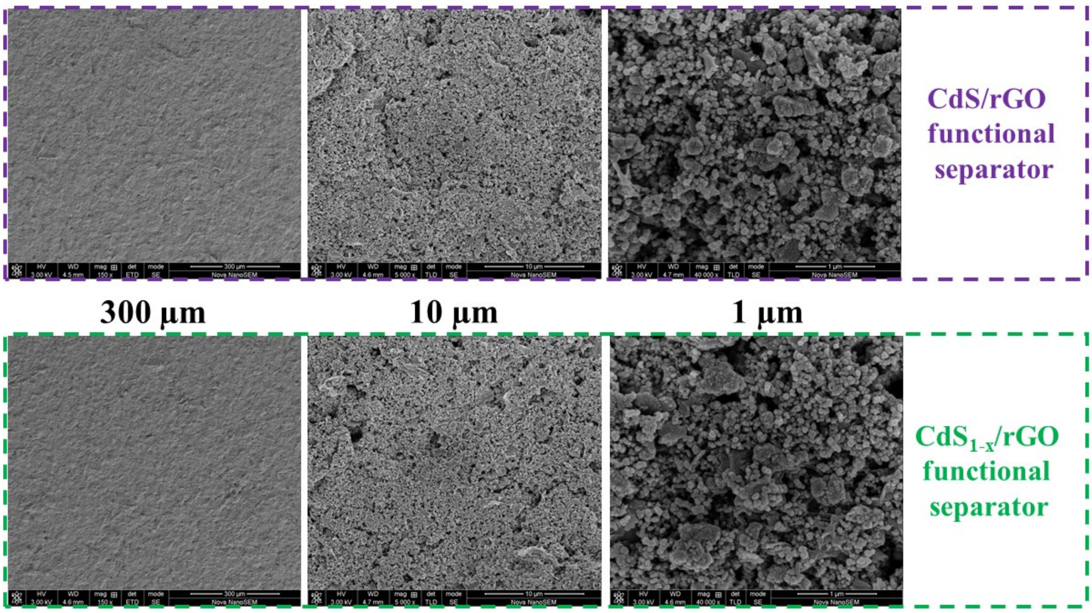

Fig. S2. SEM images of the CdS_{1-x} NSs/rGO and CdS NSs/rGO functional separators.

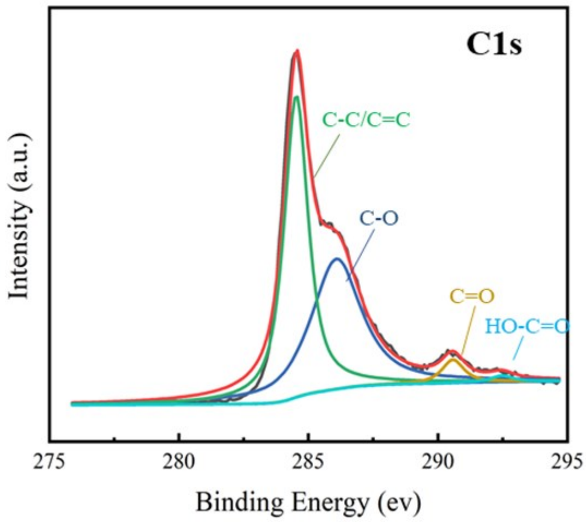

Fig. S3. C 1s XPS spectrum of the CdS_{1-x} NSs/rGO functional separator.

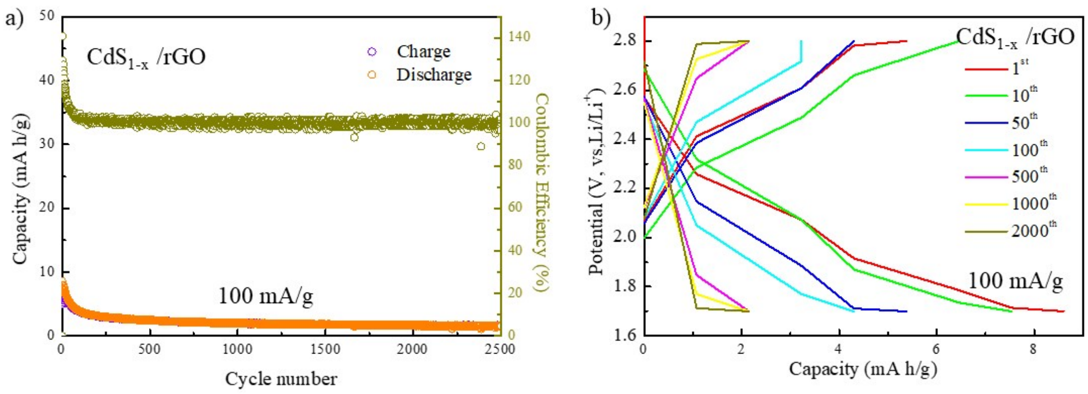

Fig. S4. The intrinsic lithium storage performance of CdS_{1-x} NSs/rGO.

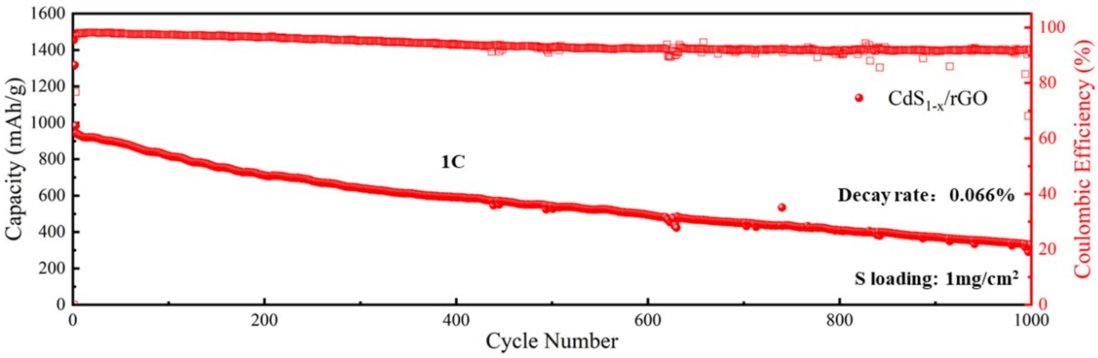

Fig. S5. Cycling performance of the CdS_{1-x} NSs/rGO functional separator with 1 mg/cm^2 S loading at 1C.

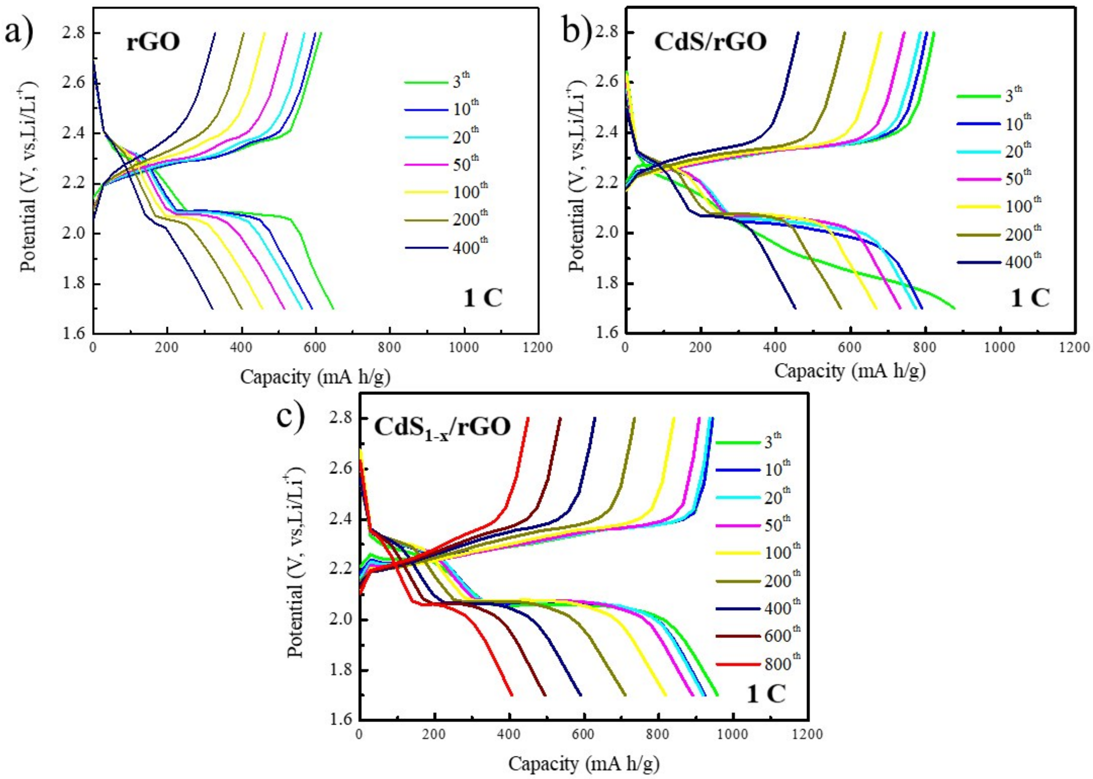

Fig. S6. The discharge/charge curves of the cells with the rGO, CdS NSs/rGO, and CdS_{1-x} NSs/rGO functional separators at 1 C.

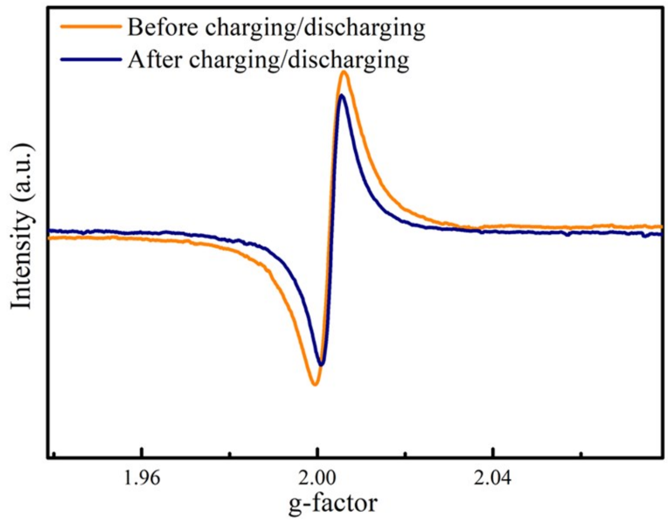

Fig. S7. EPR patterns of the cells with the CdS_{1-x} NSs/rGO functional separator before and after repeated charging/discharging.

Table S1 Comparison of catalysts with deficiencies reported to date for Li-S batteries

Catalysts	Rate performance	Initial capacity/Capacity decay (%)	Methods for fabricating deficiencies	References
MoS_{2-x}/HMC	730 mA h/g (2 C)	/	Annealing in H_2/Ar	1
MoS_{2-x}/rGO	826 mA h/g (8 C)	1159.9 mA h/g / 0.33 after 100 cycles at 0.2 C	Annealing in H_2/Ar	2
CNT@TiO_{2-x}	597 mA h/g (2 C)	1149 mA h/g / 0.33 after 100 cycles at 1 C	Annealing in H_2/Ar	3
$NiCo_2O_{4-x}$	855 mA h/g (5 C)	1221 mA h/g / 0.045 after 800 cycles at 0.2 C	Hydrothermal followed by annealing in air	4
O_2 plasma treated PP separator	/	1028 mA h/g / 0.49 after 105 cycles at 0.2 C	O_2 plasma treatment	5
TiS_{2-x}	807 mA h/g (2 C)	956 mA h/g / 0.04 after 1000 cycles at 1 C	Vacuum heat treatment	6
$Ti_{1-x}O_2$	746 mA h/g (2 C)	656 mA h/g / 0.025 after 500 cycles at 1 C	Solvothermal reaction followed by thermal calcination	7
Fe/Co_3O_4	783 mA h/g (2 C)	902 mA h/g / 0.017 after 1000 cycles at 1 C	Hydrothermal reaction followed by thermal calcination	8
SnS_2/TiO_2	449 mA h/g (2 C)	841 mA h/g / 0.064 after 500 cycles at 0.5 C	Hydrothermal reaction	9
Co_3S_{4-x}	634mA h/g (2 C)	750 mA h/g / 0.017after 400 cycles at 1 C	Hydrothermal reaction	10
TiO_2–Ar	571 mA h/g (2 C)	911 mA h/g / 0.082 after 500 cycles at 1 C	Annealing in Ar	11
$Co_{5.47}N_x$-C	640 mA h/g (2 C)	708 mA h/g / 0.04 after 1000 cycles at 2 C	Thermal calcination in NH_3	12
CdS_{1-x} NSs/rGO	837 mA h/g (2 C)	983 mA h/g / 0.089 after 500 cycles at 1 C	Electroreduction treatment	This Work

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