Supporting Information for

ZnO quantum dots modified rGO with enhanced electrochemical performance for lithium sulfur batteries

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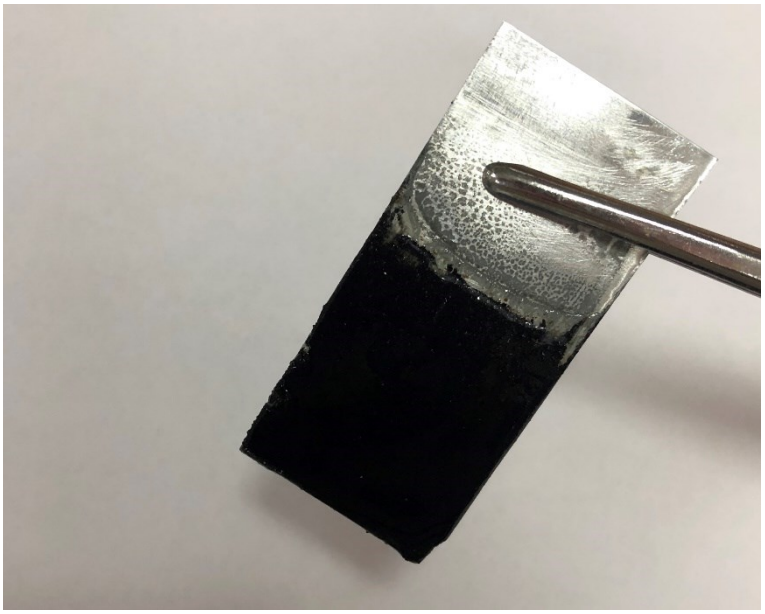

Figure S1. Photograph of Zn foil after being immersed in GO solution for 4 hours, with a layer of GO@ZnO attaching on its surface.

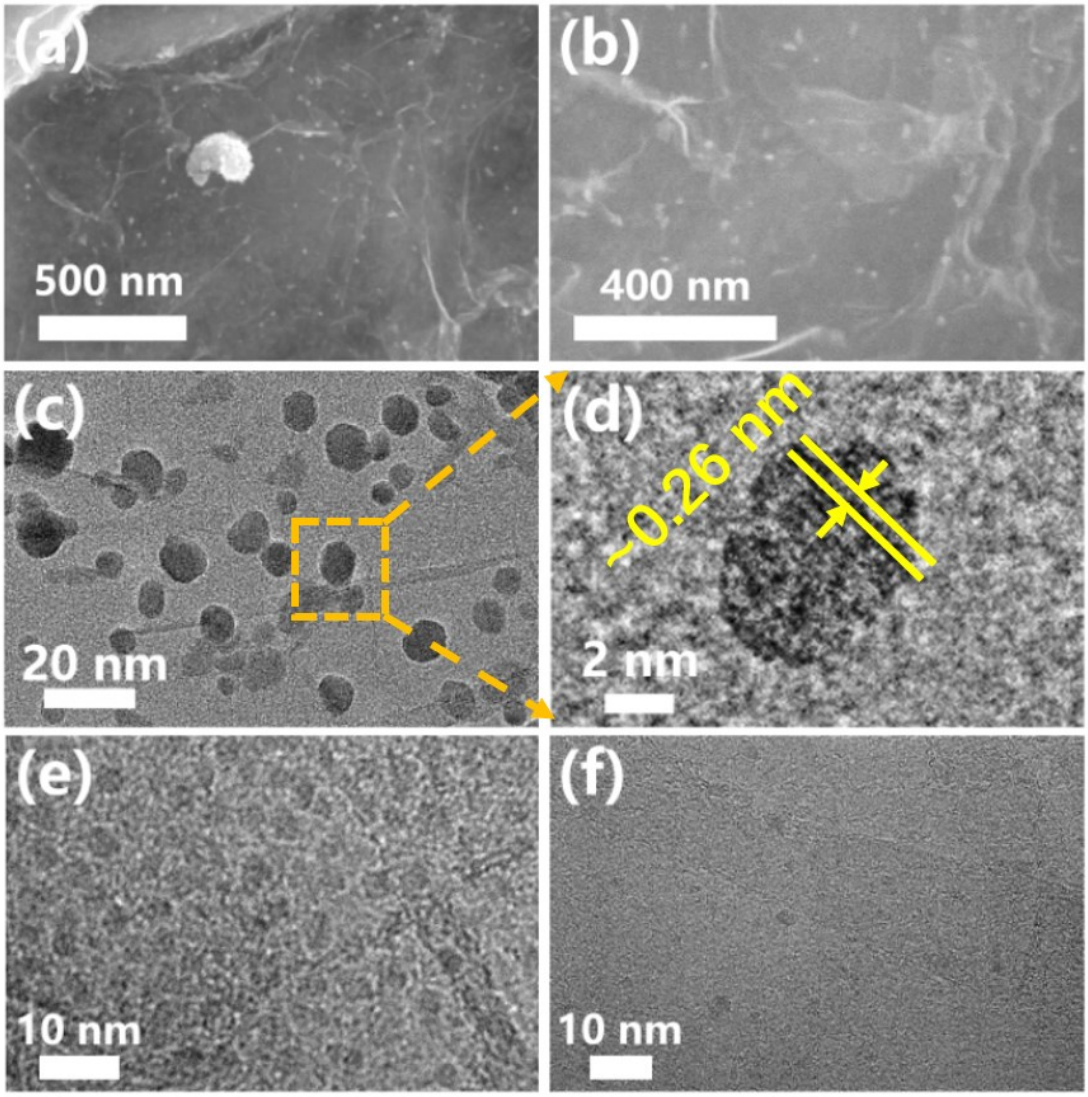

Figure S2. The morphology of ZnO QDs with different acid etch time. (a-b) 5 min; (c-d) 10 min; (e) 30 min; (f) 1 h.

We have controlled the etching time to 5 minutes, 10 minutes, 30 minutes, and 1 hour to observe the morphology change of ZnO QDs. As shown in Figure 1 (a-b), after treated with HCl for 5 minutes, ZnO nanoparticle could still be observed, with a diameter of about 200 nm. Besides, lots of ZnO nanoparticles sized approximately 30 nm emerged, which were beyond QD level. With the etching time of 10 minutes, uniformly distributed ZnO QDs were prepared a diameter of 5-10 nm (Figure 1c-d). What's more, the ZnO QDs exhibited clear morphology and precisely interplanar spacing of ~0.26 nm, corresponding to lattice plane of (002) of ZnO. When the etching time was extended to 30 minutes, the size of ZnO QDs was diminished to 2~5 nm, with unclear boundary, as shown in Figure 1e. Finally, with long etching time of 1 hour, the

obtained ZnO QDs was are very sparsely distributed and difficult to detect. Moreover, its size was further reduced and uneven. After comparison, we finally selected the 10 minutes' etching sample with uniform distribution, proper size, and clear boundary to carry out the following experiments.

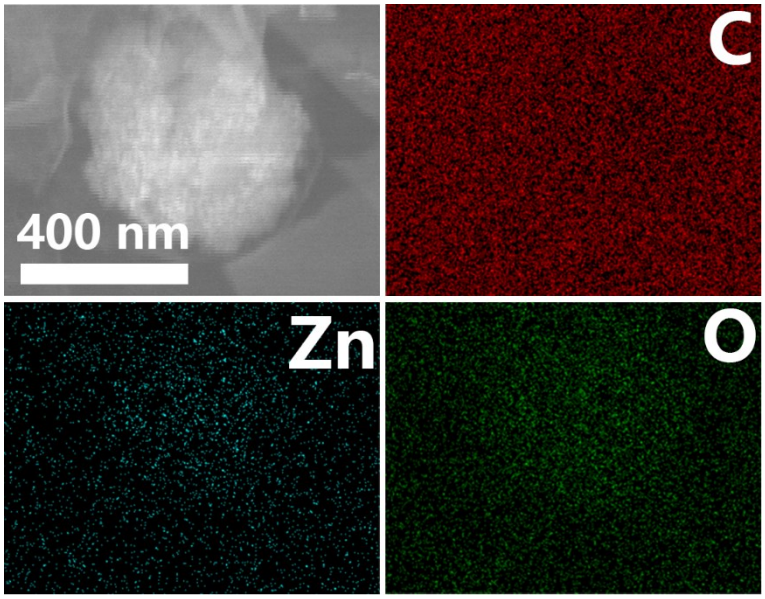

Figure S3. EDS elemental mappings of rGO@ZnO.

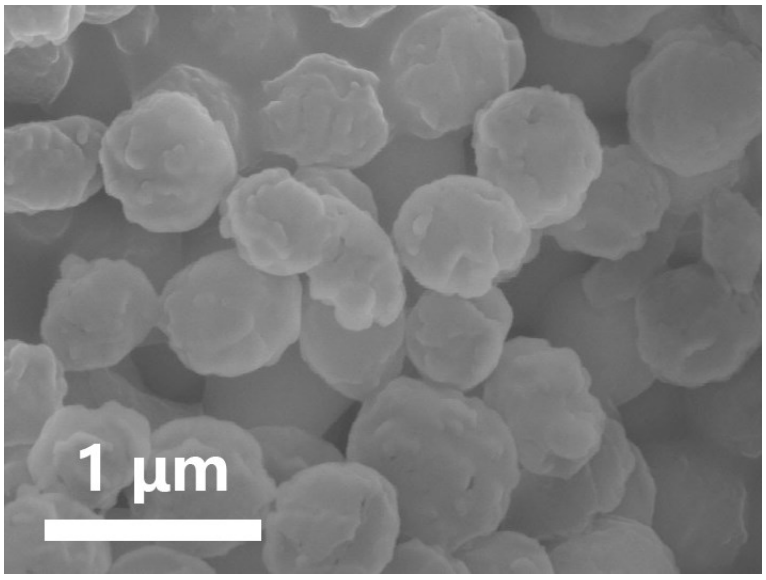

Figure S4. SEM image of sulfur spheres.

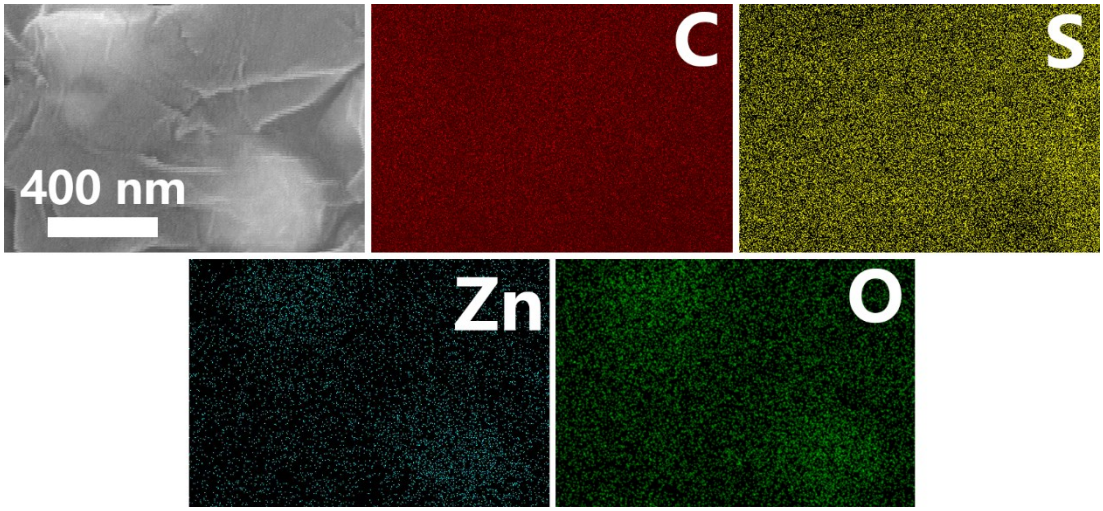

Figure S5. EDS elemental mappings of rGO@ZnO/S composite.

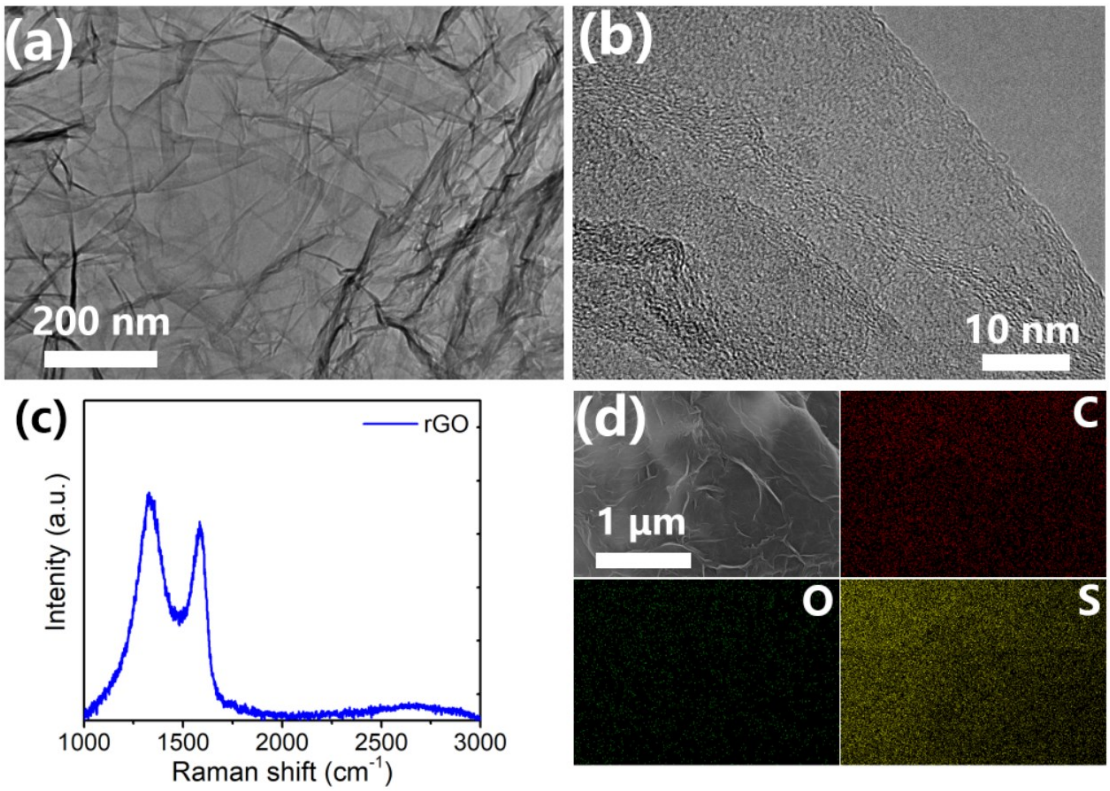

Figure S6. (a) TEM and (b) HRTEM image of rGO; (c) Raman spectrum of rGO; (d) EDS elemental mappings of rGO/S.

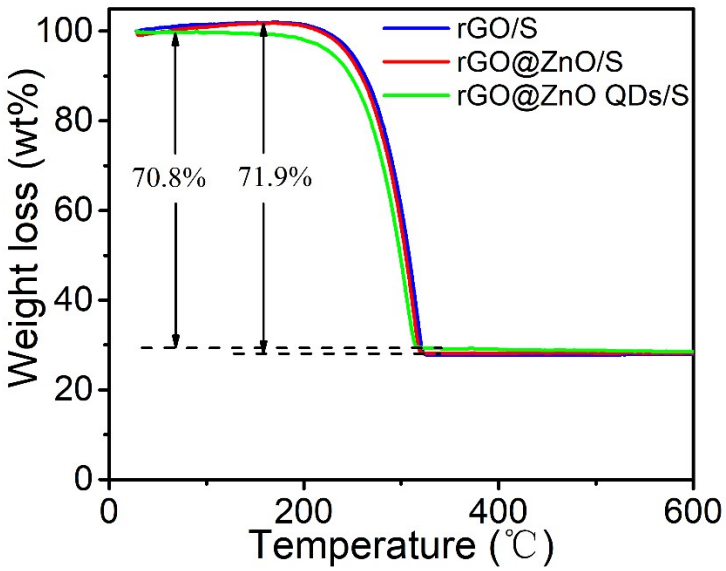

Figure S7. TGA curves of composites rGO/S, rGO@ZnO/S, and rGO@ZnO QDs/S.

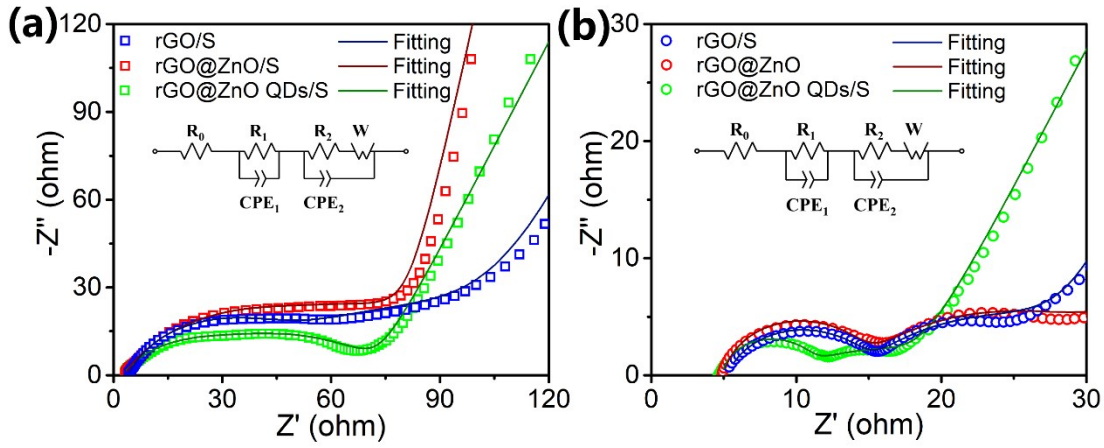

Figure S8. Nyquist plots of rGO/S, rGO@ZnO/S, and rGO@ZnO QDs/S (a) before cycling and (b) after 50 Cycles at 0.5C with equivalent circuits inserted.

Table S1. The impedances of rGO/S, rGO@ZnO/S, and rGO@ZnO QDs/S before cycling and after 50 cycles at 0.5 C.

Impedances	0 cycle		50 cycles	
	R_0 (Ω)	R_{ct} (Ω)	R_0 (Ω)	R_{ct} (Ω)
rGO/S	4.0	40.4	5.3	10.7
rGO@ZnO/S	2.9	64.8	5.0	13.8
rGO@ZnO QDs/S	2.5	44.2	4.8	8.3

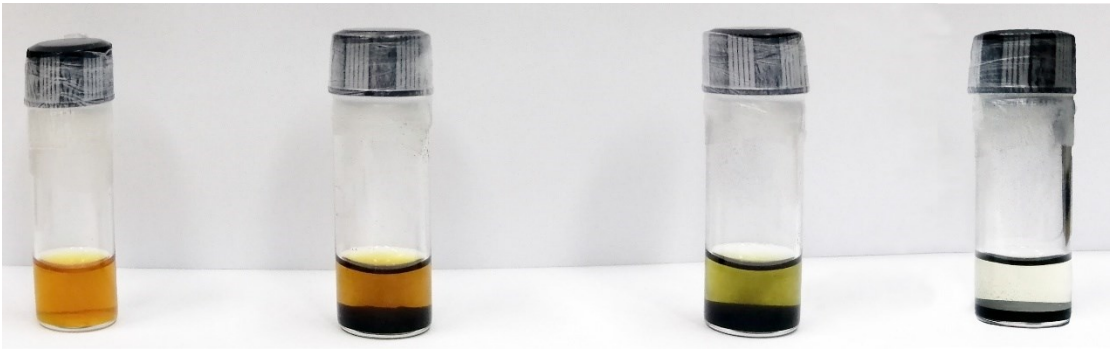

Figure S9. Visualized polysulfides adsorption experiments. The samples form lest to right are pure Li_2S_6, rGO, rGO@ZnO, and rGO@ZnO QDs in Li_2S_6, which were kept still at room temperature for 6 hours before taking photographs.

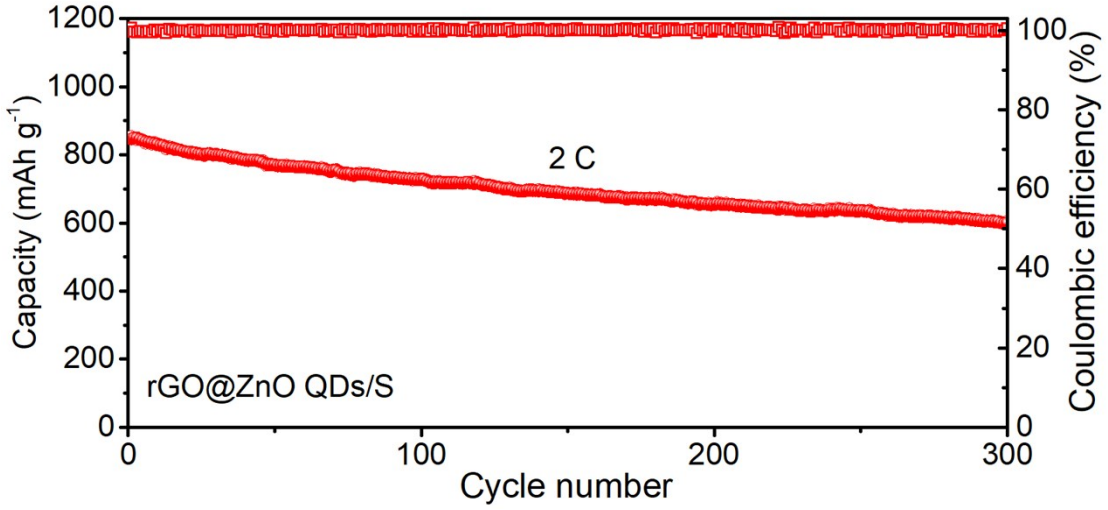

Figure S10. Cycling performance of rGO@ZnO QDs/S at a high rate of 2 C.

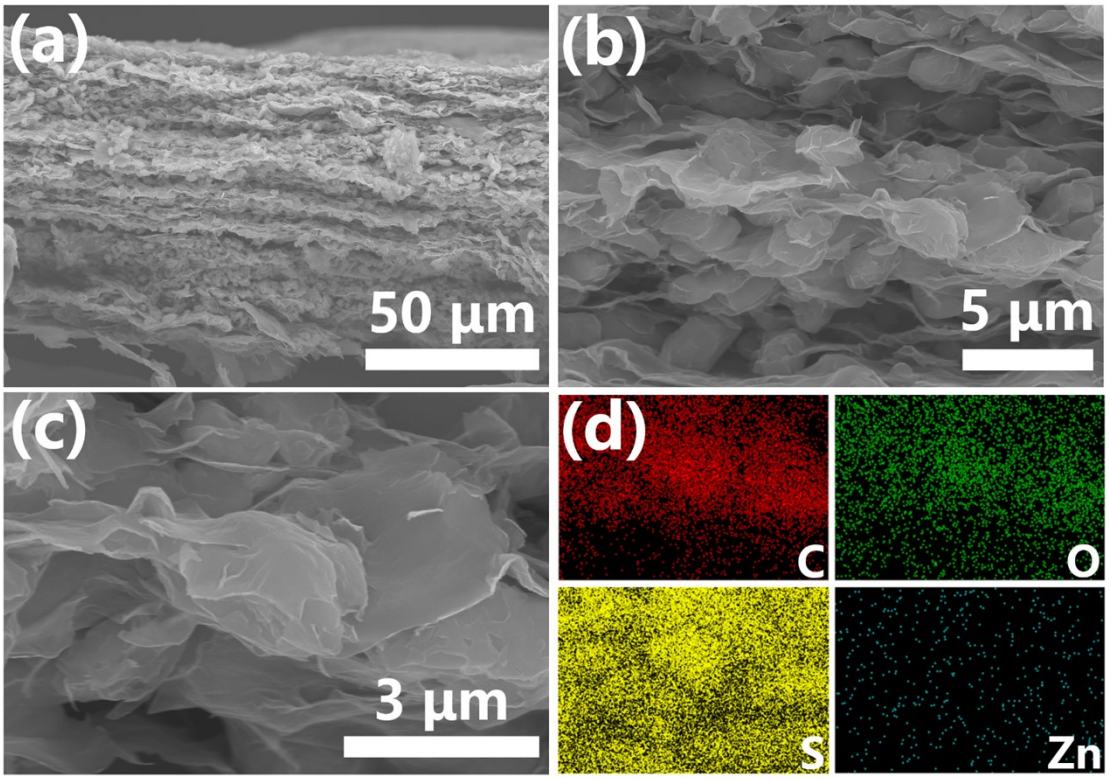

Figure S11. (a-c) SEM image and (d) EDS mapping of rGO@ZnO QDs/S-G before heat treatment.

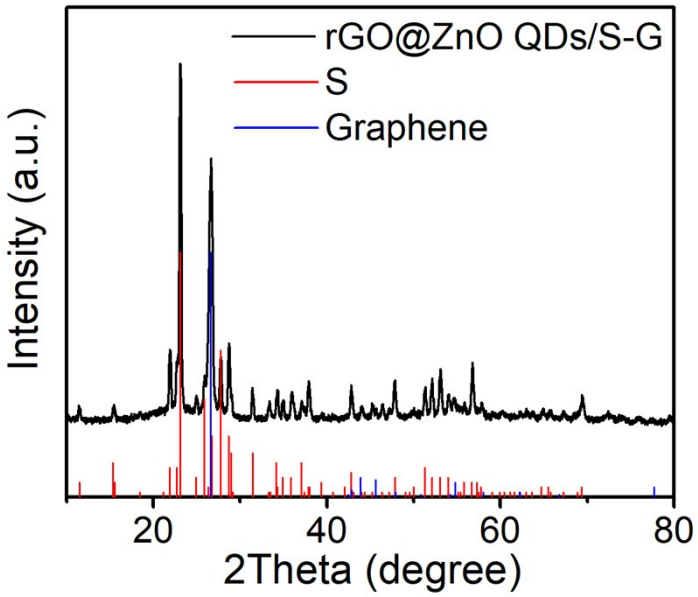

Figure S12. XRD pattern of rGO@ZnO QDs/S-G.