

Supporting information of improving the cyclability of lithium-sulfur battery by coating PPy onto the graphene aerogel-supported sulfur

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GA/S/PPy composite shows the high mechanical strength. As shown in Fig. S1a, GA/S/PPy composite can easily support 100 g weight with little deformation. We can cut the GA/S/PPy sample into a thin disk without roll-pressing process due to self-supported structure and good mechanical property of the GA/S/PPy composite (Fig. S1b).

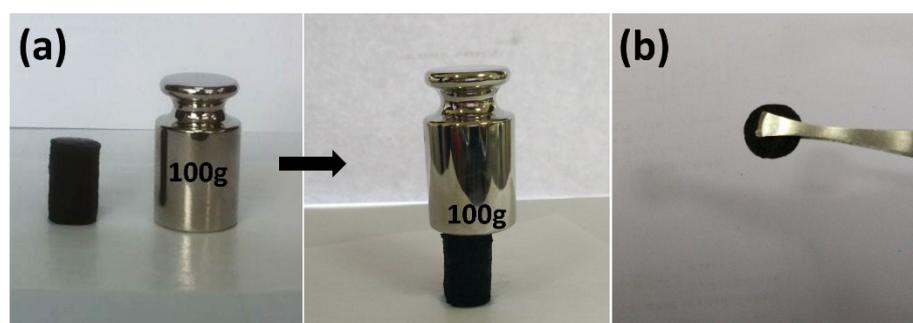


Fig. S1 (a) Photograph of the GA/S/PPy cylinder sample allowing supporting weight, (b) GA/S/PPy sample is cut into thin disk and used as cathode directly.

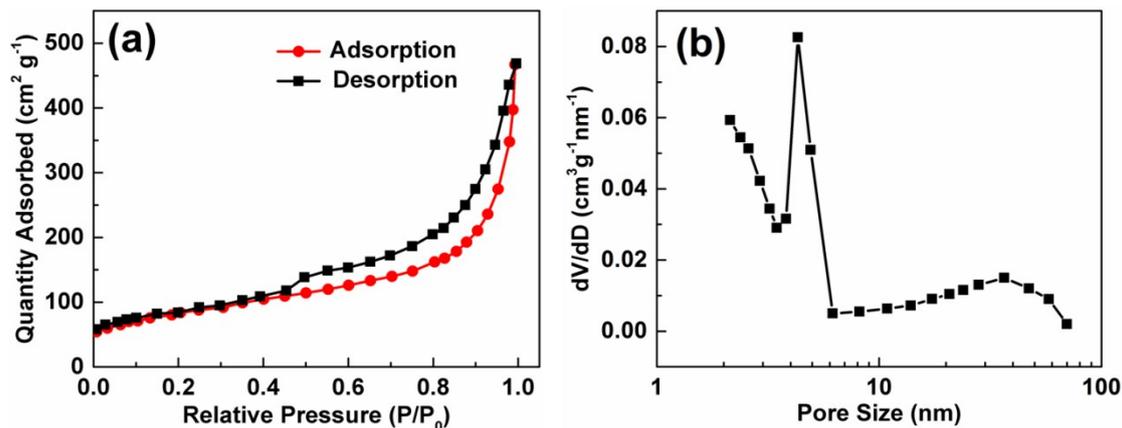


Fig. S2 (a) N₂-sorption isotherm and (b) the pore size distribution plot of GA.

The hierarchical architecture of GA was confirmed by nitrogen adsorption and desorption measurements (Fig. S2). A typical type-IV isotherm characteristic with a distinct adsorption hysteresis loop indicates there are relatively large macropores and mesopores in the 3D framework of GA (Fig. S2a). Brunauer-Emmett-Teller (BET) and Barrett-Joyner-Halenda (BJH) analyses also reveal that GA has a high specific surface area of $\sim 316 \text{ m}^2 \text{ g}^{-1}$ and much of its pore volume ($\sim 0.81 \text{ cm}^3 \text{ g}^{-1}$) lies in the range 2-70 nm (Fig. S2b).

We disassembled a cell after 20th full discharge and the cathode was washed with dimethyl carbonate in an argon-filled glove box. After drying at ambient temperature for 24 h in the glove box, the electrode was transferred to the SEM system immediately. As shown in Fig. S3a, the 3D porous architecture is maintained well and S, PPy is still coated on the graphene sheets after the assembly of the cell, indicating the high structural stability. In addition, the EDX mapping images in Fig. S3 b-d show uniformly distribution of C, S and N elements in the GA/S/PPy electrode, with no visible phase segregation after extended cycling.

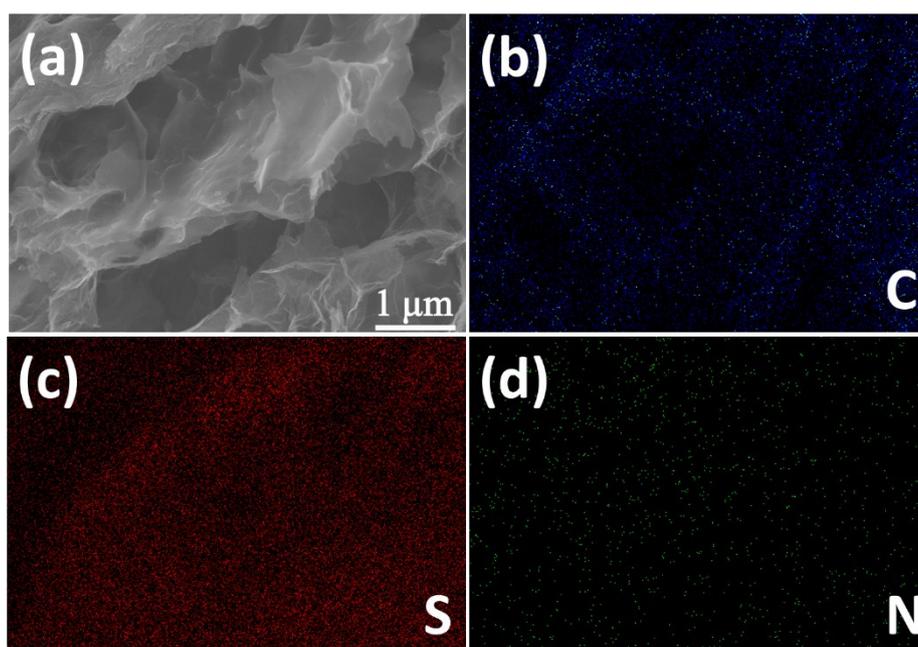


Fig. S3 (a) SEM image of GA/S/PPy composite after the 20th discharge in the cell and corresponding elemental mapping for (b) C, (c) S and (d) N.