Supporting Information

Sulfur-Inserted Polymer-Anchored Edge Exfoliated Graphite for Durable Positive Electrode for Lithium-Sulfur Batteries

Nanami Uesugi[1], Natsuho Kazahaya[1], Koki Yamada[1], Seiya Kojo[1], Hiroshi Yoshitani[2], Takuya Wada[2], Hiroji Fukui[2], Shoji Nozato[2], Yu Katayama[1], and Hiromori Tsutsumi [1]*

[1] Department of Applied Chemistry, Graduate School of Sciences and Technology for Innovation, Yamaguchi University, Tokiwadai, Ube, 755-8611, Japan

[2] Advanced Technology Institute, Corporate R&D Center, Sekisui Chemical Co., Ltd., 2-1 Hyakuyama, Shimamoto-cho, Mishima-gun, Osaka 618-0021, Japan

Table S1 Summary of the sulfur loading, initial capacity, capacity retention, and the sulfur loading methods of the state-of-the-art positive electrodes.

Classification	Sulfur loading / wt.%	Initial capacity / mAh g^{-1}	Capacity retention / %	Sulfur loading method
Mesoporous carbon-S[1]	50	1200	60@1 C, 100th cycle	Sulfur melt adsorption
Hollow carbon sphere-S[2]	64	1020	68@0.1 C, 100th cycle	400°C heat treatment
CNT-S[3]	75	1560	47@0.2 C, 150th cycle	Sulfur melt adsorption
Graphene-S[4]	70(before annealing)	750	69@0.2 C, 100th cycle	Emulsion: $Na_2S_2O_3$ + Triton-X100 + HCl
Carbon black-S[5]	64.7	1220	68@0.1 C, 50th cycle	/

Table S2 Electrical conductivity of KB, G, ExG, and PPG-EExG.

	Electrical conductivity / S cm^{-1}
KB	15.16
G	466.4
ExG	1777
PPG-EExG	240.7

Table S3 Brunauer-Emmett-Teller (BET) surface area of KB, G, ExG, and PPG-EExG.

	BET surface area / m^2 g^{-1}
KB	1226
G	7.256
ExG	27.34
PPG-EExG	151.5

Table S4 Mass loading of sulfur on the cathode, catalyst loading, and sulfur content calculated from TG curve for the catalyst in this study.

	Mass loading of Sulfur / mg	**Mass of catalyst / mg**	**Sulfur content / wt.%**
PPG-EExG-S(Mix)	1.267	1.75	72
G-S (Mix)	1.867	2.73	69
EG-S (Mix)	2.267	3.43	66
PPG-EExG-S (Chem)	0.607	0.90	67
G-S (Chem)	1.15	1.80	64
EG-S (Chem)	1.992	2.90	68
KB-S (Chem)	1.742	2.60	67

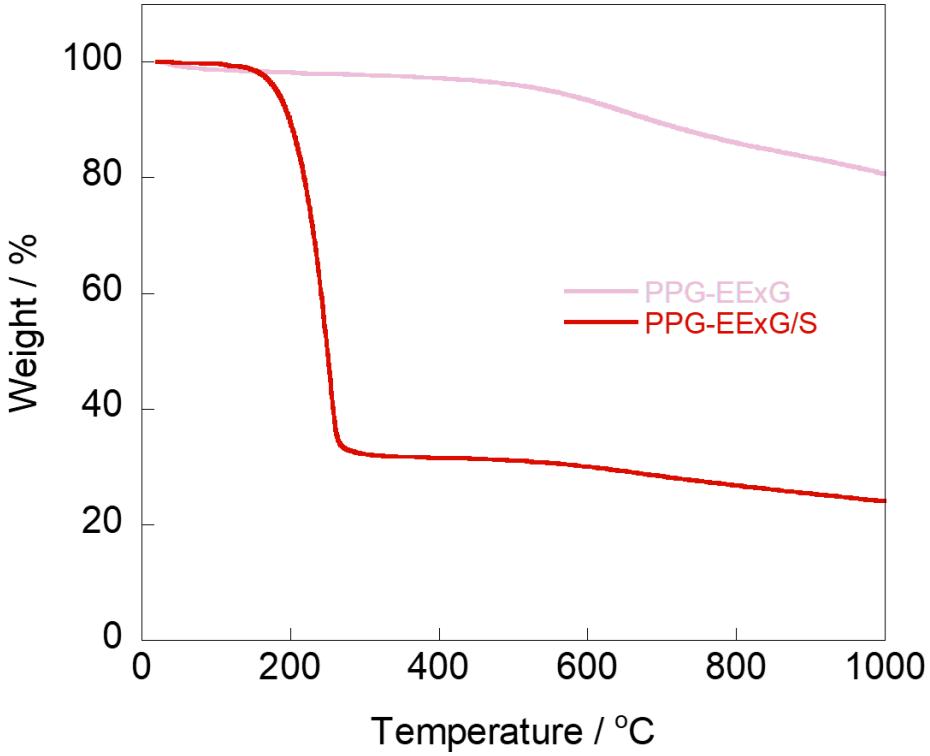

Figure S1 Thermogravimetric curves for PPG-EExG and PPG-EExG-S(chem) obtained under He atmosphere at a heating rate of 20°C min^{-1}. Weight loss observed above 500°C corresponds to the decomposition of the PPG anchor.

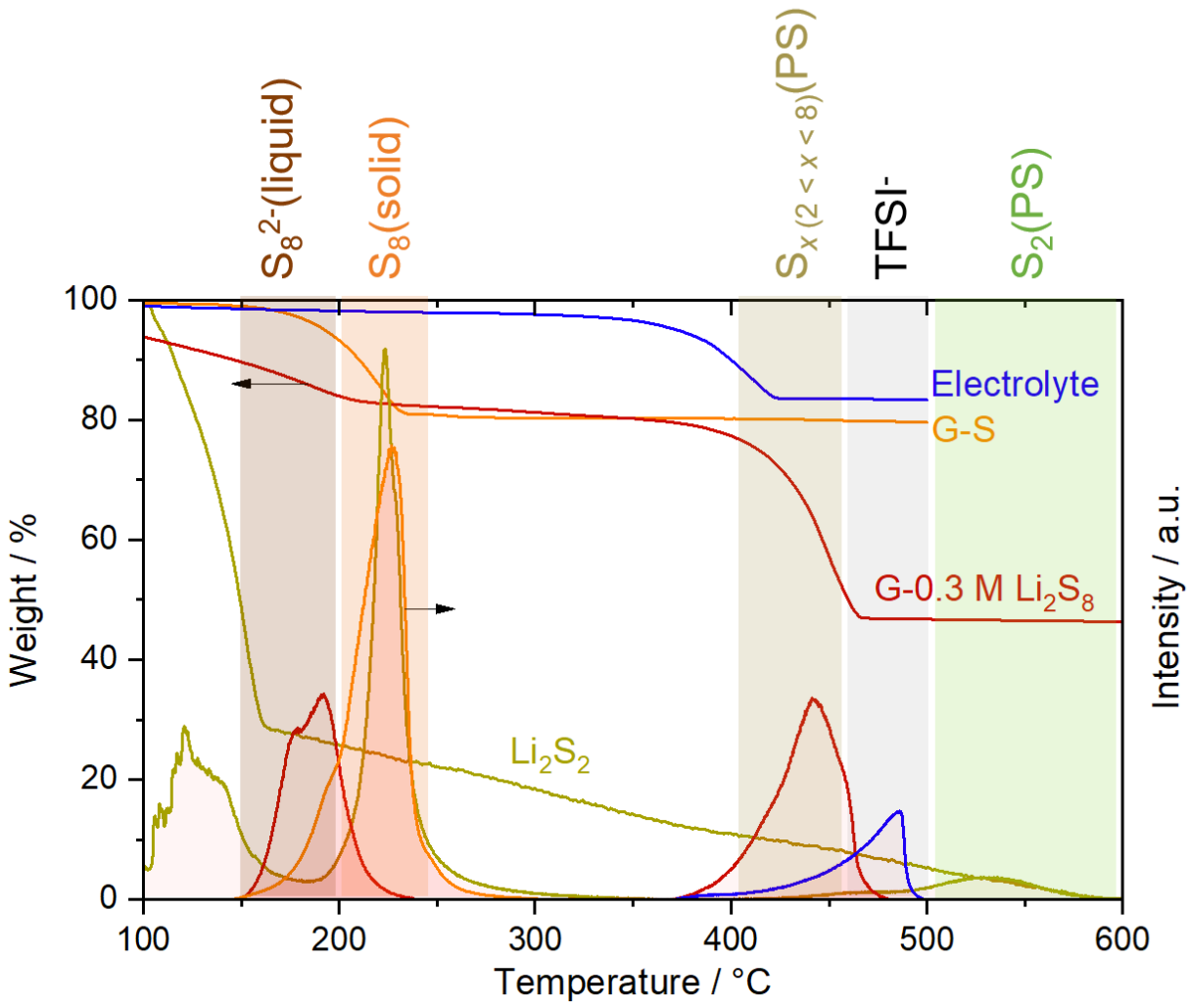

Figure S2 Gas chromatography-mass spectroscopy (GC-MS) curves for M/S = 64 of pure electrolyte (1 M LiTFSA in DME/DOL solution with 0.1 M $LiNO_3$ additive), G-S, G-0.3 M Li_2S_8 (0.3 M Li_2S_8 in 1 M LiTFSA in DME/DOL solution impregnated graphite electrode), and Li_2S_2. The corresponding thermogravimetric curve is also shown.

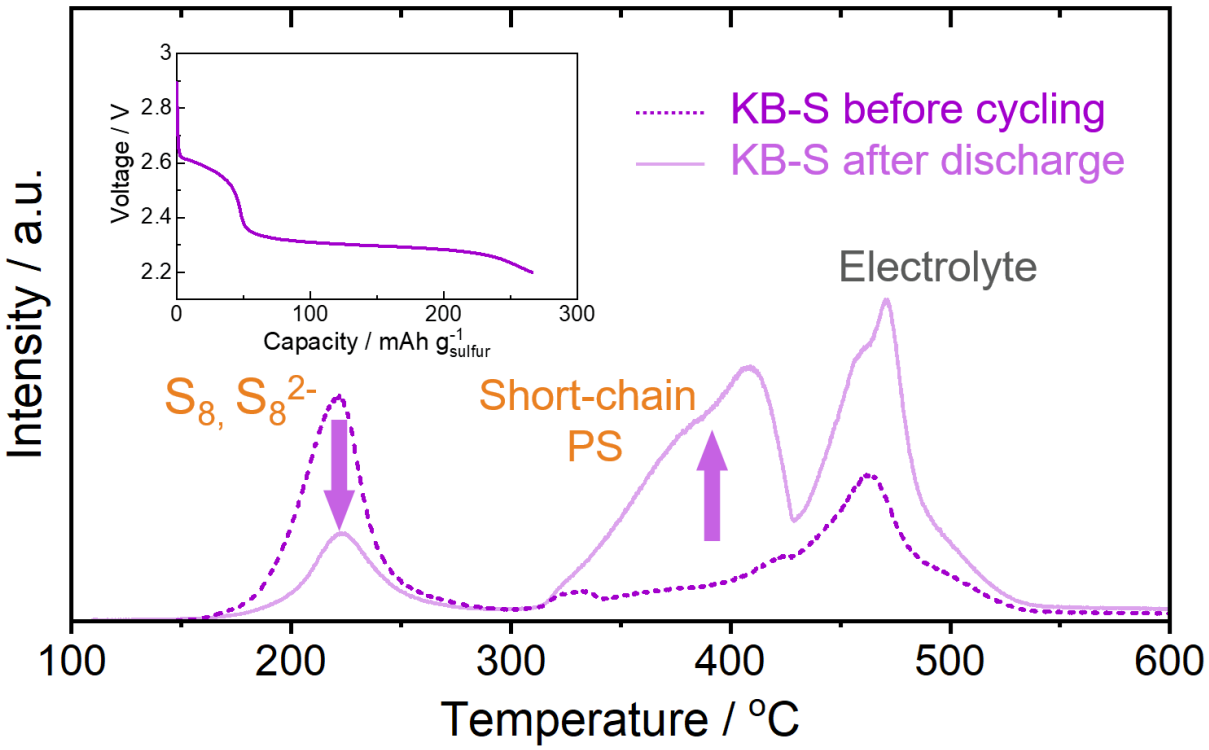

Figure S3 Gas chromatography-mass spectroscopy (GC-MS) curves for M/S = 64 of KB-S before and after the initial discharge process. Galvanostatic discharge measurements were performed in the potential range of 1.7−2.2 V at 30 °C. The corresponding discharge curve is shown in the inset.

References:

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