The role of electrocatalytic materials for developing post-lithium metal||sulfur batteries

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Supplementary Tables

Supplementary Table 1. The acronyms and associated full names in **Figure 1a-1d**.

Systems	Acronyms	Full names	Ref
Na/K‖S	S-PAA-4M KTFSI	Sulfur-based positive electrode containing poly (acrylic acid) with 5M Potassium bis (trifluoromethane sulphonyl) imide electrolyte	1
	S-CMK3-5M KTFSI	Sulfur in ordered mesoporous carbon CMK-3 with 5M Potassium bis (trifluoromethane sulphonyl) imide electrolyte	2
	Polysulfide CN	Polysulfide in carbon nanotubes	3
	S-MC	Sulfur in microporous carbon	4
	S-CNF-SWCNT	Sulfur in carbon nanofiber with a single-wall carbon nanotube coated separator	5
	S-MPCF	Sulfur in multiporous carbon fibers	6
	SPAN	Sulfurized polyacrylonitrile	7
	S-CuSA/NC	Sulfur in nitrogen-doped carbon with Cu single-atom catalyst	8
	SPAN-PAA	Sulfurized polyacrylonitrile with poly (acrylic acid) binder	9
	S-Mo_2N-W_2N	Sulfur-based electrode with a Mo_2N-W_2N heterostructure catalyst	10
	S-Ni-MOF	Sulfur-based electrode with a Ni-based metal-organic framework additive	11
	S-Ni-NCF	Sulfur in nitrogen-doped carbon fibers with a Ni hollow sphere catalyst	12
	S-MCHS	Sulfur in mesoporous carbon hollow nanospheres	13
Mg/Ca‖S	S-ACC	Sulfur in activated carbon cloth	14
	S-KB	Sulfur in Ketjenblack	15
	S-ACC	Sulfur in activated carbon cloth	16
	S-C	sulfur in porous carbon	17
	S-ZIF-C	Sulfur in zeolitic imidazolate frameworks-67 derivative carbon host	18
	S-rGO-CC	Sulfur with reduced graphene oxide in carbon cloth	19
	S-Cu-CFs	Sulfur in carbon nanofibers with a Cu nanoparticle additive	20
	S-MC	Sulfur in microporous carbon	21
	S-meso-C	Sulfur in mesoporous carbon	22
	S-G-CC	Sulfur in graphene-polyaniline coated carbon cloth	23
	S-CNT	Sulfur in carbon nanotube	24
	S-KB-DMSO	Sulfur in Ketjenblack with dimethyl sulfoxide-based electrolyte solutions	25
Al‖S	S-MWCNT	Sulfur in multi-wall carbon nanotube	26

	S-HPC	Sulfur in hierarchical porous carbon	27
	S-CNF	Sulfur in carbon nanofiber	28
	S-CoNG	Sulfur in cobalt/nitrogen co-doped graphene	29
	S-KB	Sulfur in Ketjenblack	30
	S-HPC	Sulfur in N-doped hierarchical porous carbon	31
	S-CNT	Sulfur in carbon nanotube	32
	S-CNT	Sulfur in carbon nanotube	33
	S-KB	Sulfur in Ketjenblack	34
	S-CNF	Sulfur in carbon nanofiber paper	35
	S-CNT	Sulfur in carbon nanotube	36
Zn‖S	S-AC-I_2	Sulfur in activated carbon with the I_2 additive in the electrolyte	37
	ZnS-CF-TU	ZnS fiber with the iodinated thiourea additive in the electrolyte solution	38
	S-NPC-ZnI_2	Sulfur in nanoporous carbon with the zinc iodide additive in the electrolyte solution	39
	S-CMK3-ZnI_2	Sulfur in ordered mesoporous carbon CMK-3 with the zinc iodide additive in the electrolyte solution	40
	S-KB-TU	Sulfur in Ketjenblack with the thiourea additive in the electrolyte solution	41
	S-Se	Sulfur mixed with selenium as active materials in the positive electrode	42
	S-C-AN	Sulfur in carbon black with the acetonitrile additive in the electrolyte solution	43
	S-CNT-PEG	Sulfur in multi-walled carbon nanotubes with the polyethylene glycol additive in the electrolyte solution	44
	S-CNT-I_2	Sulfur in multi-walled carbon nanotubes with the iodine additive in the electrolyte solution	45
	SeS_2-PCS-I_2	SeS_2 in phosphorus-doped carbon sheets with the iodine additive in the electrolyte solution	46
	S-FeNC-CC	Sulfur in carbon cloth with the Fe-N_4 catalyst	47
	S-HCS- I_2	Sulfur in hollow carbon spheres with the iodine additive in the electrolyte solution	48
	S-CNF- I_2	Sulfur in carbon nanofibers with the iodine additive in the electrolyte solution	49
	S-CMK3	Sulfur in ordered mesoporous carbon CMK-3	50

Supplementary Table 2. Comparison for different metal-sulfur batteries in terms of earth abundance of metals, capacity based on sulfur electrode, cell voltage, cycling number, rate (1C = 1675 mA g^{-1}), specific energy (based on sulfur electrode), sulfur content and areal sulfur loading. The values are estimated by averaging those from a couple of representative references. The values are all tested under the room temperature or 25 °C.

	Abundance / % among earth crust[51]	Capacity /mAh g^{-1}	Cell voltage/ V	Cycling number	Rate/ C	Specific energy/ Wh kg_S^{-1}	Sulfur content/ *wt.*%	Areal sulfur loading/ mg cm^{-2}	Ref
Li||S	0.002	≈1000	≈2.1	≈1000	3	≈2100	≈50-72	≈5	52-56
Na||S	2.36	≈600	≈1.5	≈800	1	≈900	≈40-60	≈3-5	57-59
K||S	2.09	≈600	≈1.6	≈200	1	≈960	≈50	≈1-2	60
Mg||S	2.33	≈800	≈1.2	≈100	0.1	≈960	≈30-70	≈1	61, 62
Ca||S	4.15	≈800	≈1.1	≈50	0.1	≈960	≈30-50	≈0.5-2	63, 64
Al||S	8.23	≈500	≈0.6	≈100	0.5	≈900	≈40-70	≈0.5-2	35, 65, 66
Zn||S	0.007	≈600	≈0.5	≈400	5	≈900	≈40-70	≈1-2	41, 67, 68

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