



Supplementary Materials: Plasma-Enhanced Carbon Nanotube Fiber Cathode for Li-S Batteries

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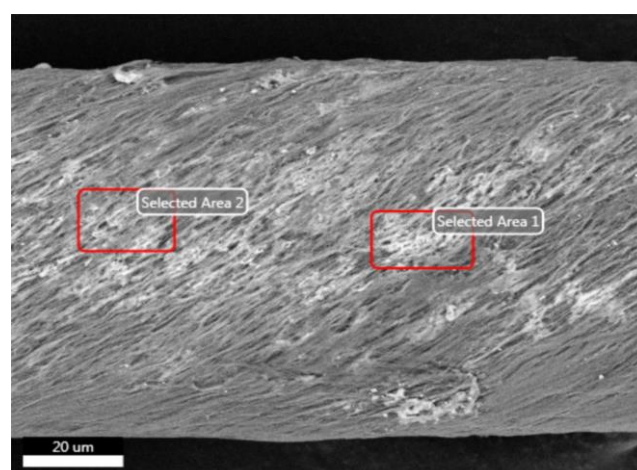
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Abstract: Fiber-shaped batteries have attracted much interest in the last few years. However, a major challenge for this type of battery is their relatively low energy density. Here, we present a freestanding, flexible CNT fiber with high electrical conductivity and applied oxygen plasma-functionalization, which was successfully employed to serve as an effective cathode for Li-S batteries. The electrochemical results obtained from the conducted battery tests showed a decent rate capability and cyclic stability. The cathode delivered a capacity of 1019 mAh g⁻¹ at 0.1 C. It accommodated a high sulfur loading of 73% and maintained 47% of the initial capacity after 300 cycles. The demonstrated performance of the fiber cathode provides new insights for the designing and fabrication of high energy density fiber-shaped batteries.

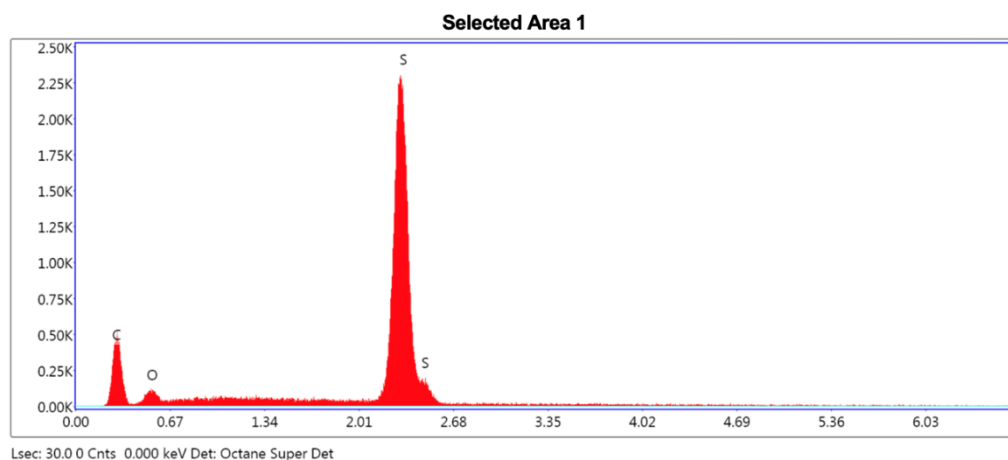
Keywords: lithium-sulfur batteries; fiber battery; CNT; oxygen plasma functionalization; polysulfide

1. EDS analysis of OCNT-S and CNT-S.

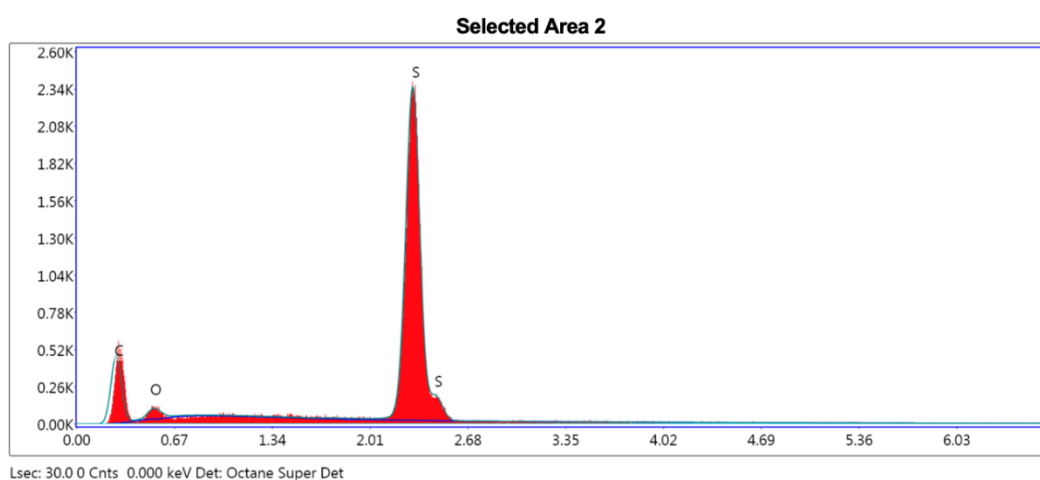
a1



a2

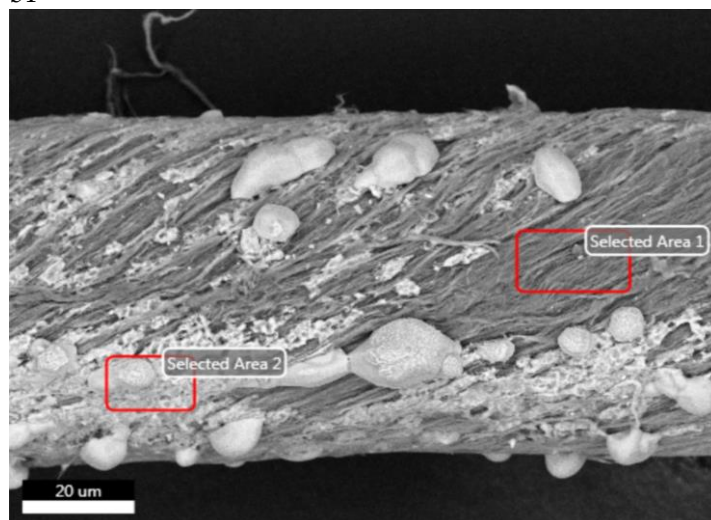
**eZAF Smart Quant Results**

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
C K	45.70	68.67	240.66	11.84	0.07	1.1	0.96	0.14	1
O K	1.35	1.52	21.28	29.68	0.00	1.04	0.98	0.29	1
S K	52.95	29.81	1,748.52	2.78	0.48	0.9	1.03	1	1

**eZAF Smart Quant Results**

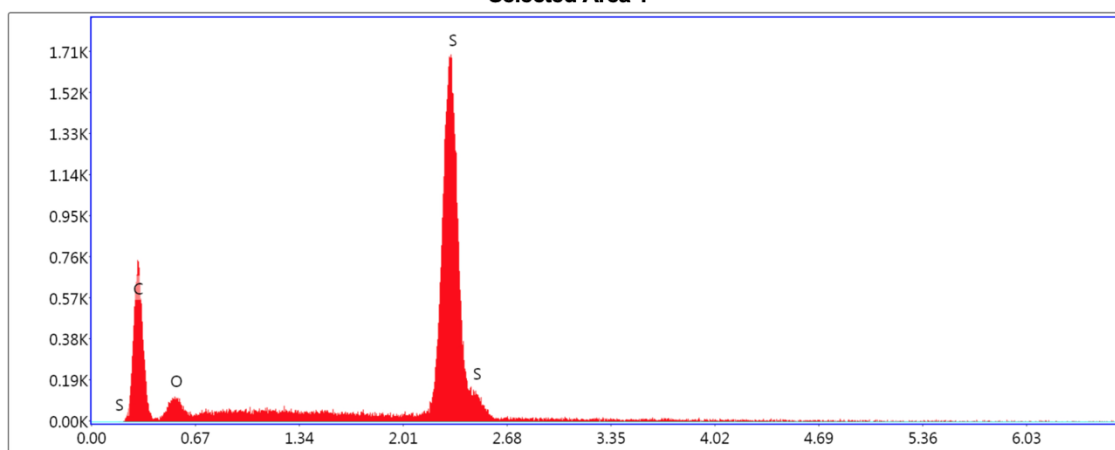
Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
C K	47.21	69.90	271.56	11.71	0.08	1.1	0.96	0.15	1
O K	1.48	1.65	24.75	26.22	0.00	1.04	0.98	0.29	1
S K	51.30	28.45	1,795.00	2.78	0.46	0.9	1.03	1	1

b1



b2

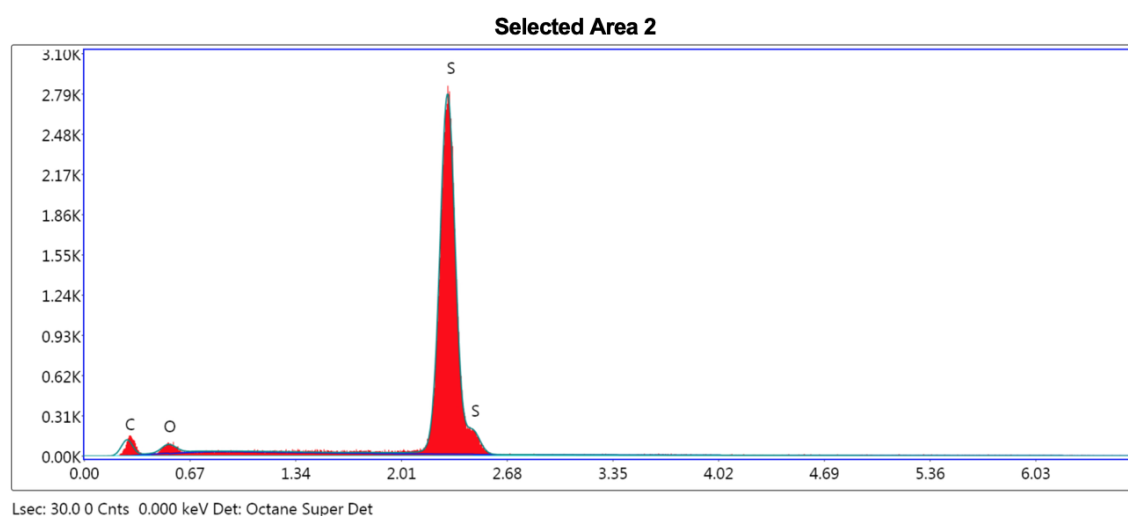
Selected Area 1



Lsec: 30.0 0 Cnts 0.000 keV Det: Octane Super Det

eZAF Smart Quant Results

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
C K	56.15	76.44	346.09	11.15	0.11	1.08	0.96	0.18	1
O K	2.33	2.38	33.67	20.24	0.01	1.02	0.98	0.29	1
S K	41.52	21.18	1,265.01	2.90	0.37	0.88	1.03	1.01	1



eZAF Smart Quant Results

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	R	A	F
C K	22.09	42.69	67.63	14.14	0.02	1.16	0.93	0.1	1
O K	1.25	1.82	17.26	31.61	0.00	1.1	0.96	0.3	1
S K	76.65	55.49	2,138.46	2.70	0.73	0.95	1.01	1	1

Figure S1. (a1) Selected areas on the OCNT-S for analysis; (a2) EDS spectrum and element analysis data at different areas of OCNT-S; (b1) Selected areas on the CNT-S for analysis; (b2) EDS spectrum and element analysis data at different areas of CNT-S.

2. EDS mapping for sulfur elemental distribution

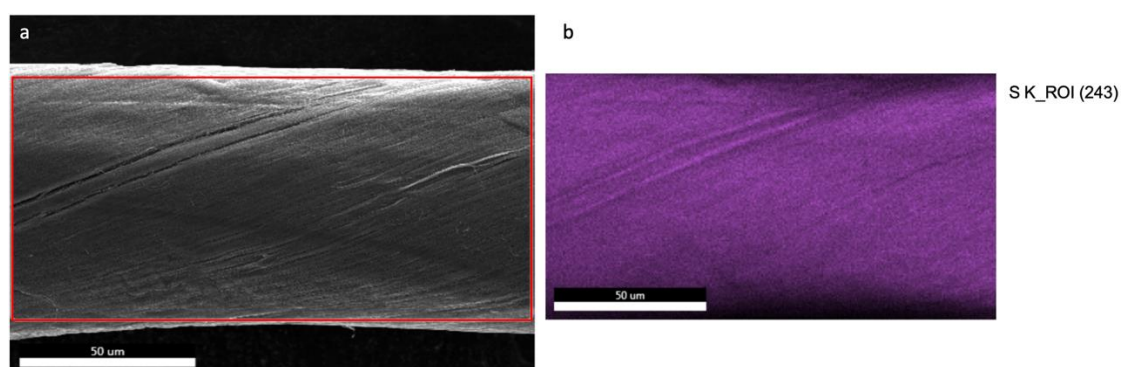


Figure S2. (a) SEM image of OCNT-S, showing the selected area for EDS mapping. (b) Sulfur elemental distribution of OCNT-S.