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Cage compound precursor-derived $Sb/Sb_2O_4/Fe_3C$ nanocomposite anchored on reduced graphene oxide as an anode for potassium ion batteries

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Materials

The rac-K_2Sb_2 (tartrate)$_2$ ($C_8H_{10}K_2O_{15}Sb_2$, AR), ferric sulfate ($Fe_2(SO_4)_3$, AR), chromium nitrate ($Cr(NO_3)_3$, AR), sodium acetate (CH_3COONa, AR), aceticacid (CH_3COOH, AR), ethanol (CH_3CH_2OH, AR), deionized water (H_2O, AR), graphite (1 wt. equiv., AR), sodium nitrate ($NaNO_3$, AR), sulfuric acid (H_2SO_4, 95%~98%), potassium permanganate ($KMnO_4$, AR), hydrogen peroxide (H_2O_2, AR), hydrogen chloride (HCl, AR) were purchased from Sinopharm Chemical Reagent Co., Ltd. All reagents were used directly without any further purification.

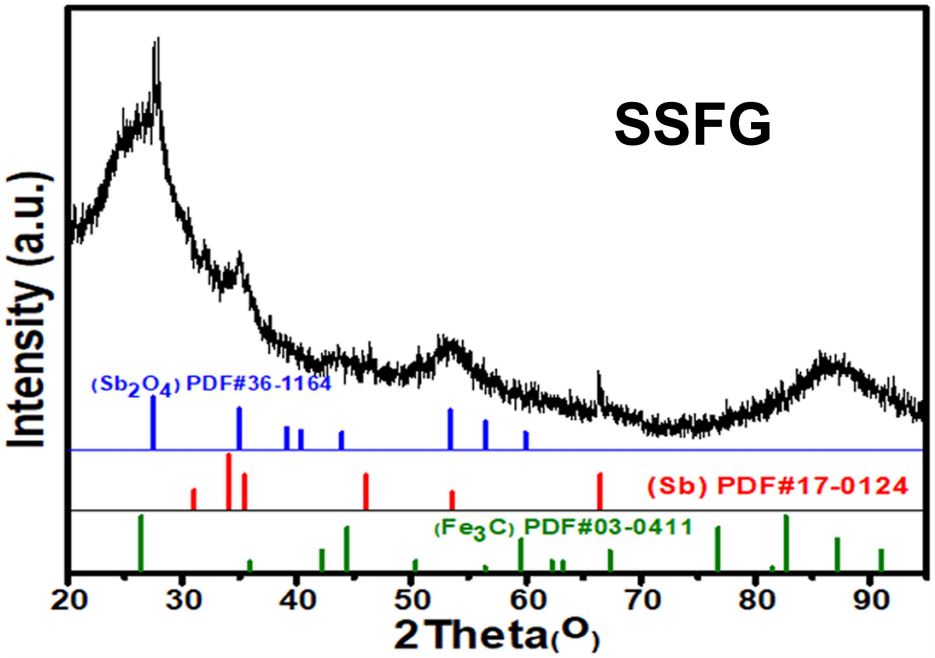

Fig. S1 The XRD pattern of SSFG.

Element Number	Element Symbol	Element Name	Atomic Conc.	Weight Conc.
6	C	Carbon	68.65	34.94
8	O	Oxygen	19.97	13.54
51	Sb	Antimony	8.79	45.38
26	Fe	Iron	2.59	6.14

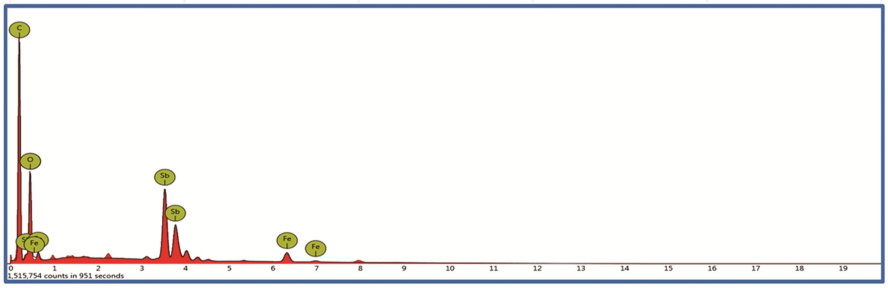

Fig. S2 The EDS spectrum of the sample SSFG.

Element Number	Element Symbol	Element Name	Weight Conc.
6	C	Carbon	20.73
8	O	Oxygen	19.32
51	Sb	Antimony	56.62
26	Fe	Iron	3.34

Fig. S3 The element contents of Sb/Fe cage compound precursors.

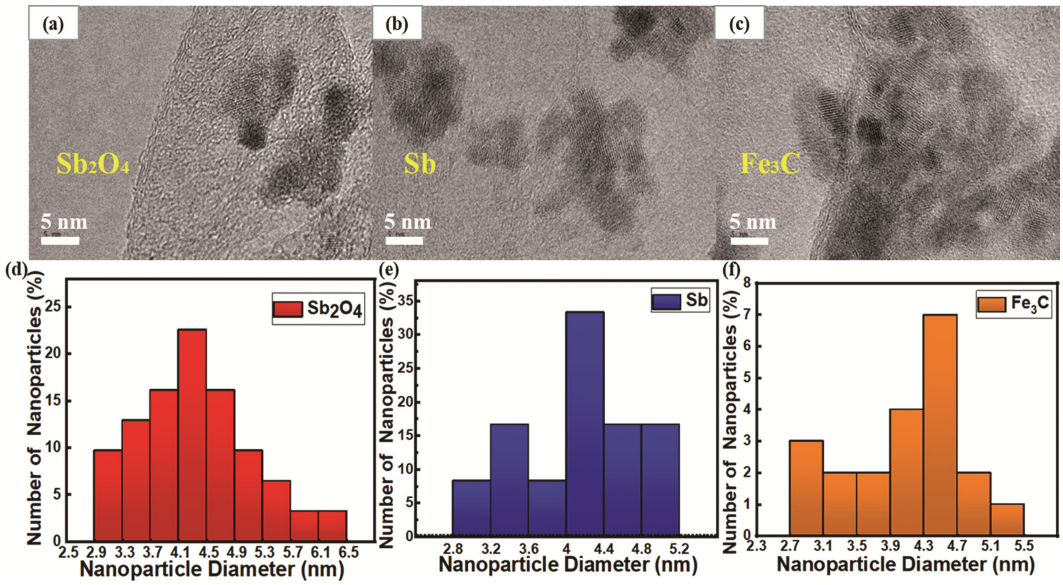

Fig. S4 The size distribution of Sb_2O_4, Sb and Fe_3C in sample SSFG. (a-c) HRTEM of Sb_2O_4, Sb and Fe_3C; (d-f) the size distributions of Sb_2O_4, Sb and Fe_3C.

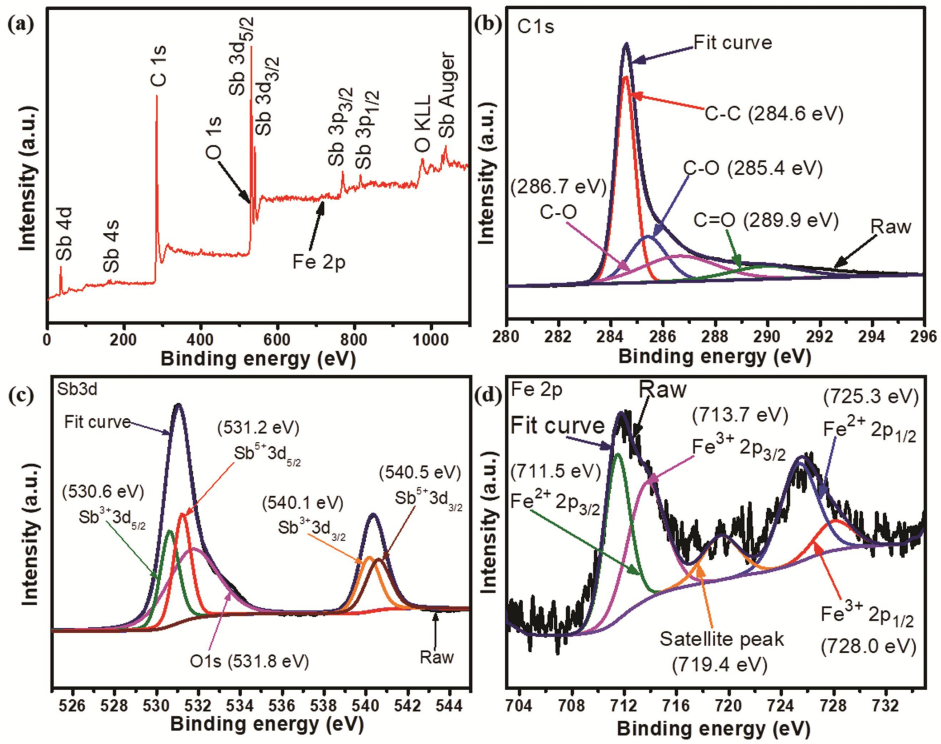

Fig. S5 The (a) full spectrum and high resolution XPS spectrums of (b) C 1s, (c) Sb 3d and (d) Fe 2p orbits in SSFG.

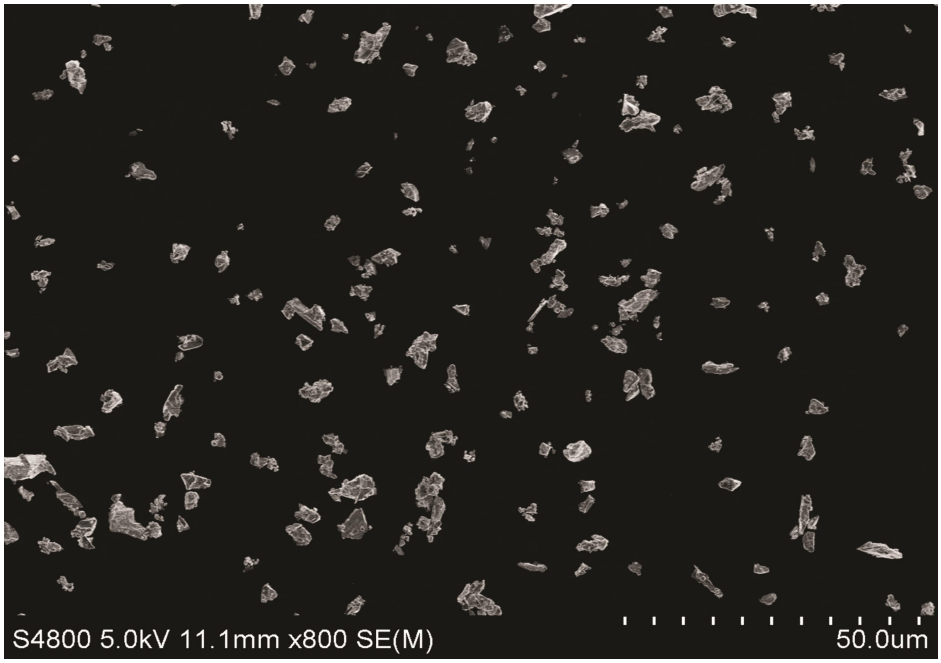

Fig. S6 The SEM of the raw Sb powder.

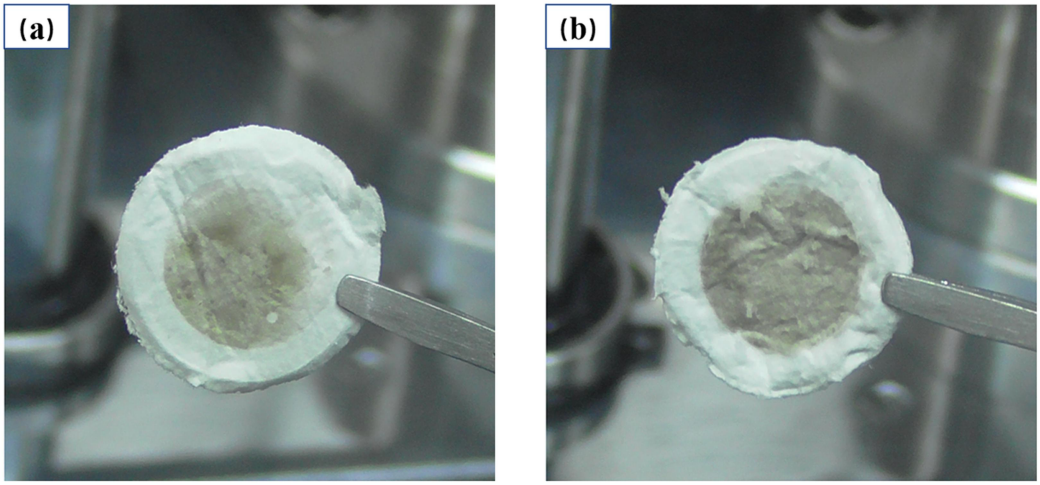

Fig. S7 Digital photographs of separators after 1000 cycles at 1 A/g in KPF_6-DME electrolyte of (a) SSFG and (b) Sb/rGO.