Supplementary Materials

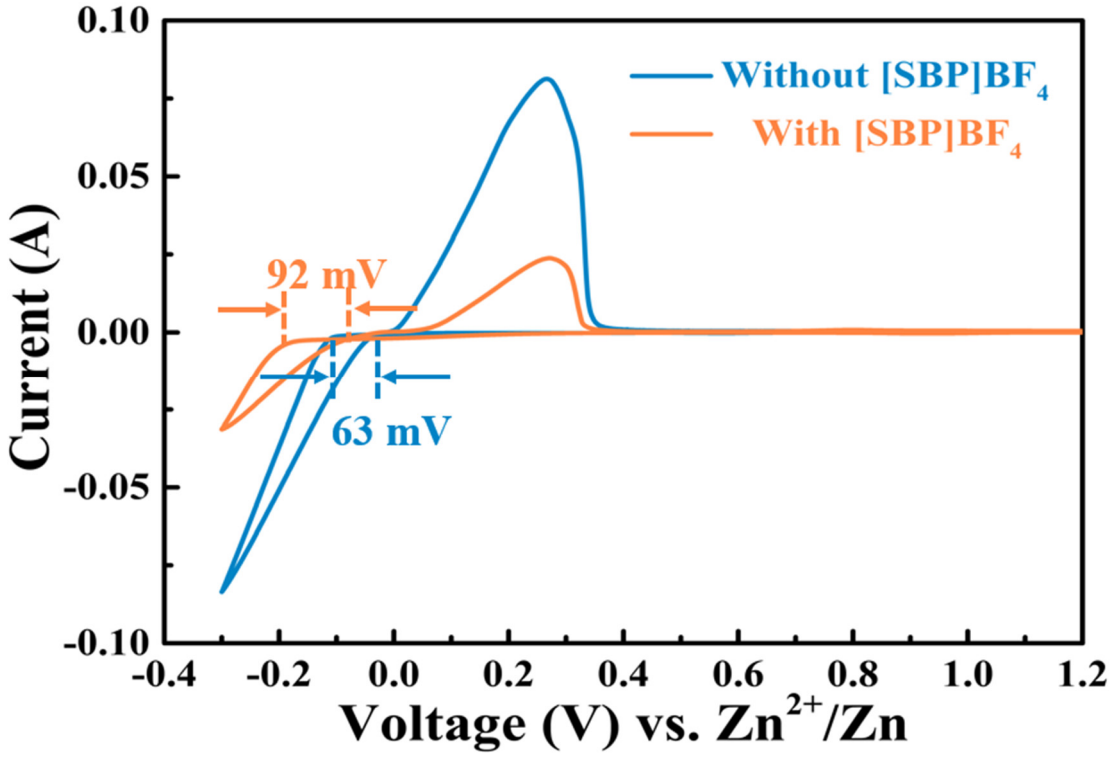

Figure S1 The CV curves of Zn//SS cells with and without $[SBP]BF_4$ at 1 mV s^{-1}.

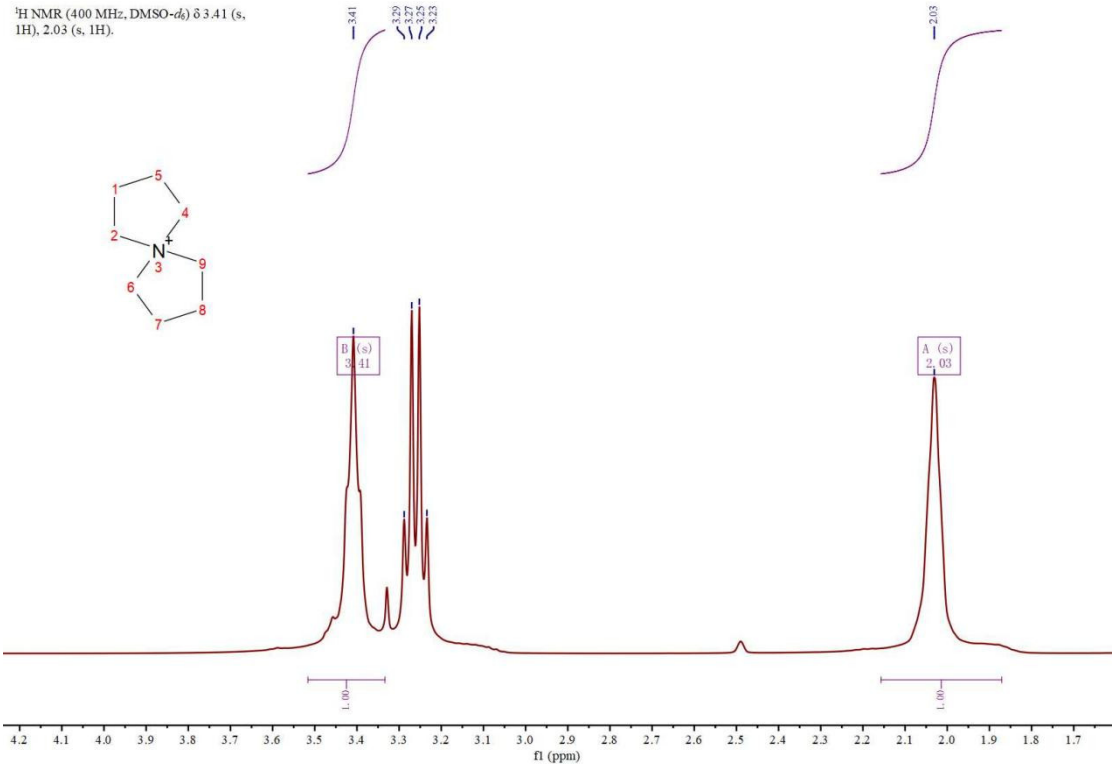

Figure S2 ^1H NMR spectra of $[SBP]BF_4$ samples.

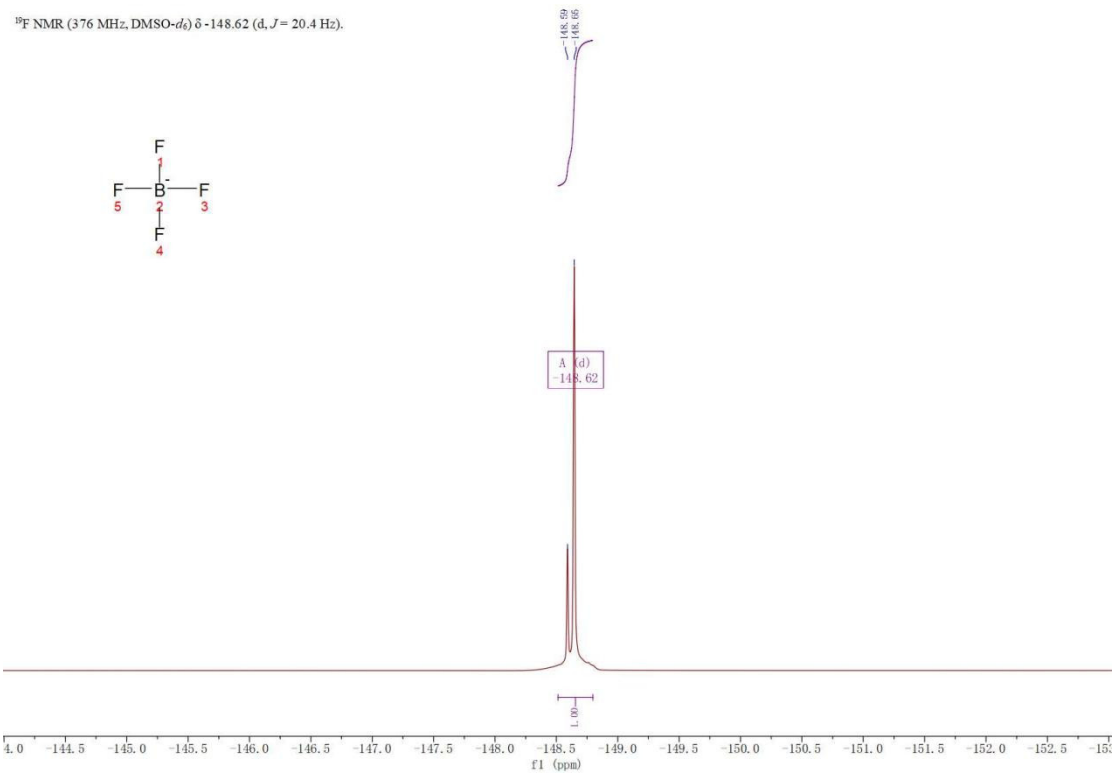

Fig. S3 ^{19}F NMR spectra of $[SBP]BF_4$ samples.

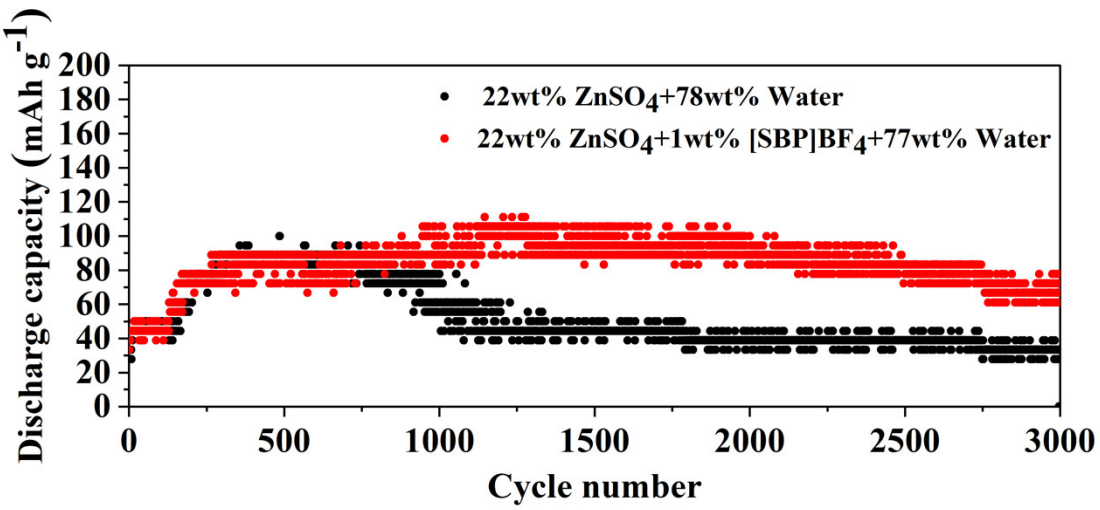

Figure S4 Cycling performance of $Zn//V_2O_5$ batteries with and without additives at 20A g^{-1} current density.

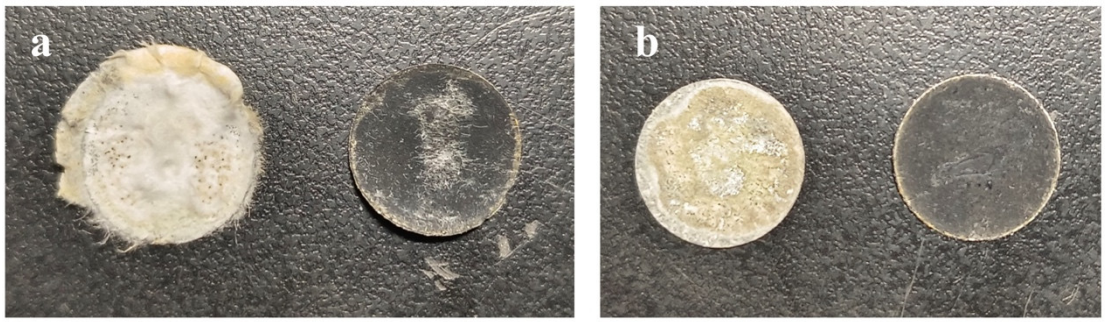

Figure S5 Photographs of the pole pieces peeled off from (a) Zn//V_2O_5 batteries without additives and (b) Zn//V_2O_5 batteries containing additives after 3000 cycles at a current density of 20A g^{-1}.

Table S1. Performance comparison of different additives.

Additives	Cycling Stability of Zn//Zn cells(h)	Cycling Stability of Zn//Cu(Ti) cells(cycles)	Cycling Stability of full cells(cycles)	Reference
1wt% $[SBP]BF_4$	1 mA cm^{-2}, 1 mAh cm^{-2} for 2000	2 mA cm^{-2}, 0.5 mAh cm^{-2} for 2200	2000 at 5 A g^{-1} 3000 at 20A g^{-1}	This work
0.5M [BMIM]OTF	1 mA cm^{-2}, 1 mAh cm^{-2} for 1000	1 mA cm^{-2}, 1 mAh cm^{-2} for 1000	3000 at 2 A g^{-1}	[35]
1wt% QL_{80}	5 mA cm^{-2}, 5 mAh cm^{-2} for 200	/	3000 at 1.5 A g^{-1}	[45]
10 mM glucose	1 mA cm^{-2}, 1 mAh cm^{-2} for 2000	1 mA cm^{-2}, 0.5 mAh cm^{-2} for 200	1000 at 3.08 A g^{-1}	[46]
3wt% DMF	1 mA cm^{-2}, 1 mAh cm^{-2} for 1600	1 mA cm^{-2}, 1 mAh cm^{-2} for 300	2000 at 5 C	[47]
1 g L^{-1} PAM	1 mA cm^{-2}, 1 mAh cm^{-2} for 180	/	200 at 0.1 A g^{-1}	[48]
4M EMImCl	1 mA cm^{-2}, 1 mAh cm^{-2} for 500	1 mA cm^{-2}, 1 mAh cm^{-2} for 100	300 at 1 A g^{-1}	[49]
1 vol% DME	2 mA cm^{-2},2 mAh cm^{-2} for 380	2.5 mA cm^{-2}, 2.5 mAh cm^{-2} for 60	3000 at 2 A g^{-1}	[50]
1M $Li(SO_3CF_3)_2$	0.5mA cm^{-2}, 0.25 mAh cm^{-2} for 1500	/	700 at 5 C	[51]
25mM $Zn(H_2PO_4)_2$	1 mA cm^{-2}, 1 mAh cm^{-2} for 1200	1 mA cm^{-2}, 1 mAh cm^{-2} for 400	1000 at 0.8 A g^{-1}	[52]