Supporting Information

Paving the Way for K-ion Batteries: Role of the Electrolyte Reactivity Through the Example of Sb-based Electrodes

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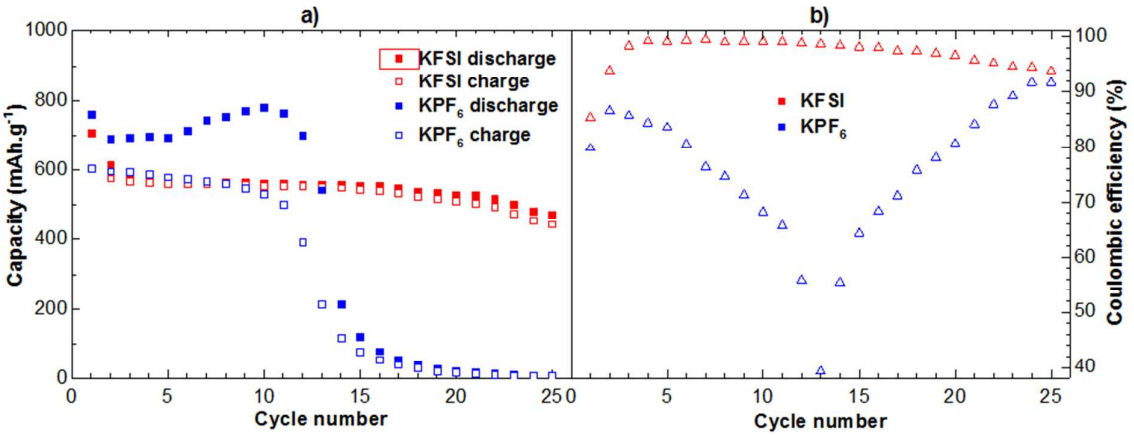

Figure S1. a) Discharge/charge capacities (mAh g^{-1}) and b) coulombic efficiency (%) for the first 25 cycles between 0.005-2 V at C/10 and 25 ± 1 °C for Sb/K coin cells filled with 0.8M KPF_6 EC:DEC and 0.8M KFSI EC:DEC. Data for only one cell is presented for better clarity.

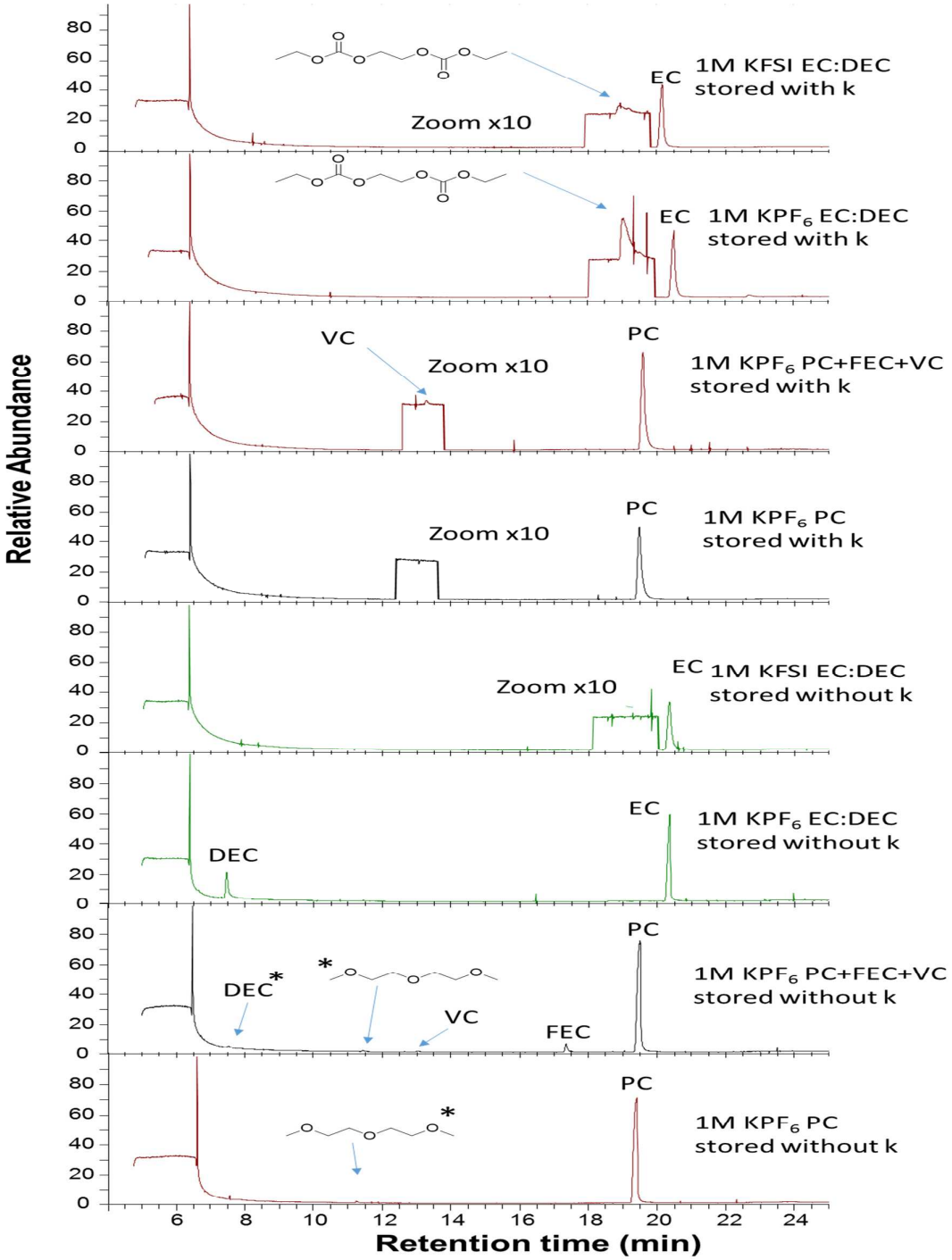

Figure S2. Chromatograms of the 1M KPF_6 PC, 1M KPF_6 PC + 5% FEC + 1% VC, 0.8M KPF_6 EC:DEC and 0.8M KFSI EC:DEC electrolytes after storage for 3 weeks at 25°C in coin cells without and with K metal. When present, the * symbol indicates electrolyte solvant originated from cross-contamination most likely during the electrolyte preparation. All other additional species arise from solvent degradation during storage or cycling.

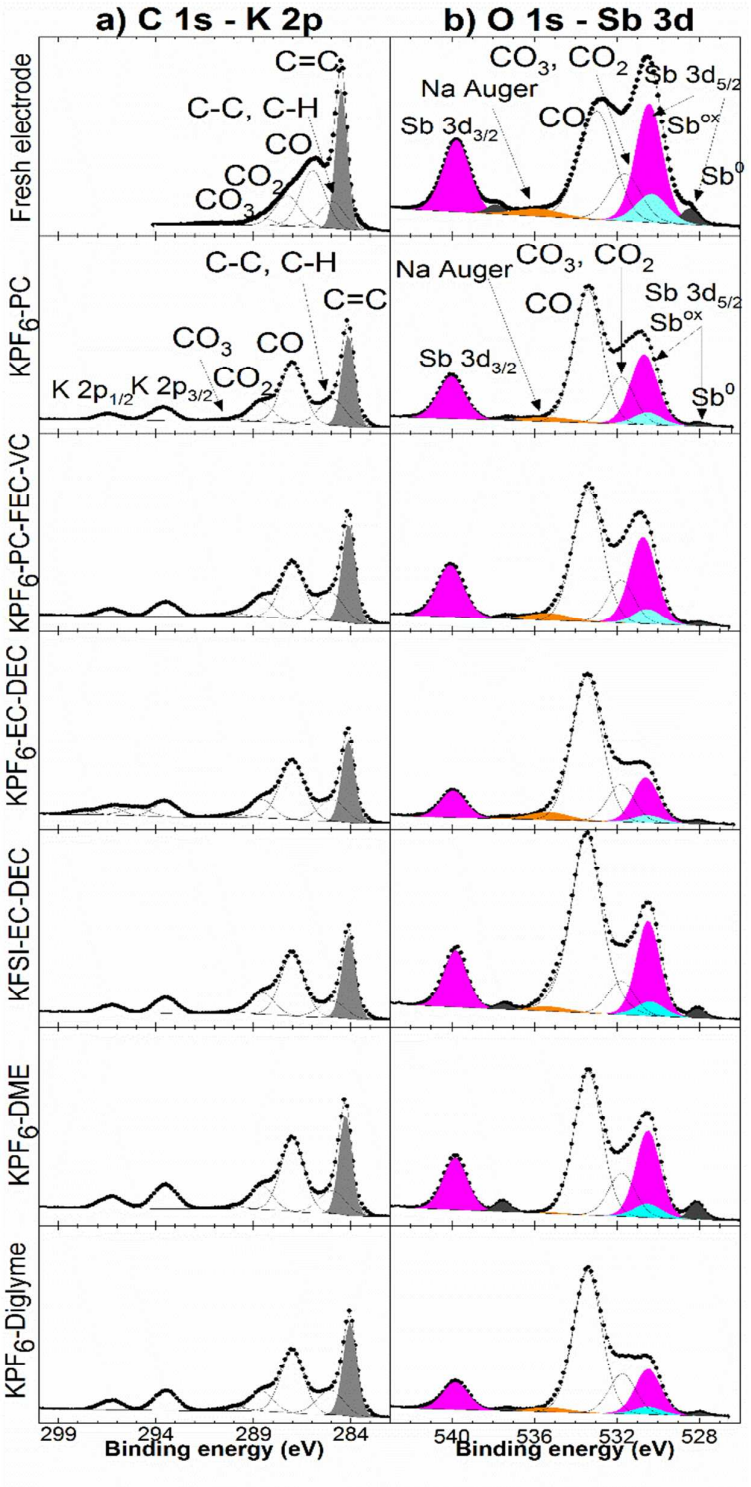

Figure S3. a) Carbon 1s - Potassium 2p and b) Oxygen 1s - Antimony 3d XPS core spectra of the fresh Sb electrode and Sb electrodes after storage for 3 weeks in coin cells without K metal for different electrolytes as indicated.

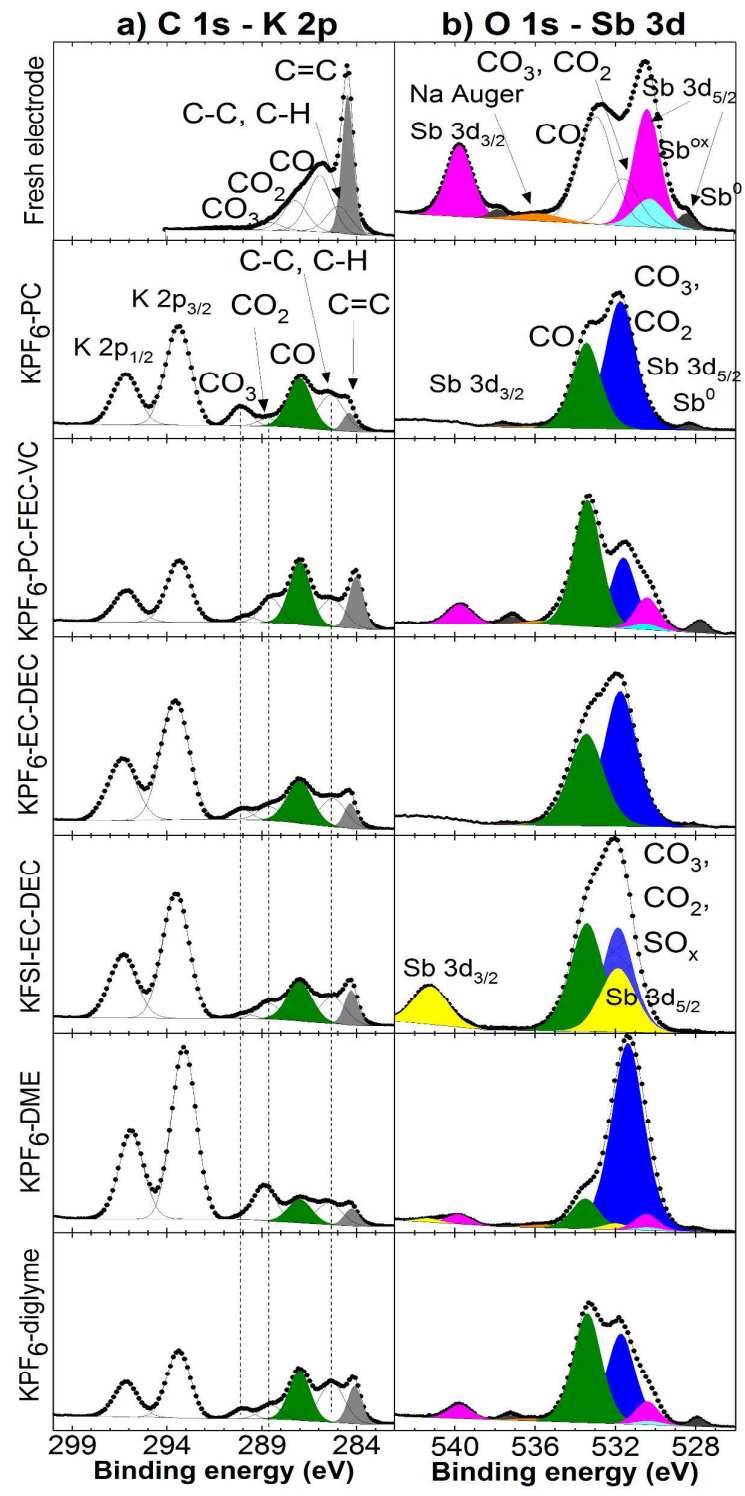

Figure S4. a) Carbon 1s - Potassium 2p and b) Oxygen 1s - Antimony 3d XPS core spectra of the fresh Sb electrode and Sb electrodes after storage for 3 weeks in coin cells with K metal for different electrolytes as indicated.

Table S1. Atomic percent (at.%) obtained from XPS quantification for Sb electrodes stored for 3 weeks in coin cells containing K metal and filled with different electrolytes as indicated as well as for Sb electrodes after one cycle between 0.005-2 V at C/5 and 25 °C for the 0.8M KPF_6 EC:DEC and 0.8M KFSI EC:DEC electrolytes.

				After storage for 3 weeks with K metal						After one cycle	
				KPF_6 PC	KPF_6 PC FEC/VC	KPF_6 EC:DEC	KFSI EC:DEC	KPF_6 DME	KPF_6 Diglyme	KPF_6 EC:DEC	KFSI EC:DEC
		B.E. (eV)	fwhm contraint	At.%	At.%	At.%	At.%	At.%	At.%	At.%	At.%
Sb 3d	Sb metal	527.9-528.2	none	0.05	0.11	0.02	-	0.02	0.06	-	-
Δ=9.4	Sb oxide	530.4-530.6	none	-	0.46	-	-	0.22	-	-	-
	Sb-F	531.9	none	-	-	-	1.1	0.11	-	-	-
C 1s	C=C (carbon)	<284.6	0.7-0.9	3.8	12.4	4.8	7.3	4.3	9.6	1.79	4.4
	C-C, C-H	285	1.4-1.6	14.5	12	11.1	10.6	9.5	17.6	10.6	7.3
	-CO	287.0	1.4-1.6	18.8	23.9	16.5	15.6	9.5	19.1	9.4	8.0
	$-CO_2$	288.6	1.2-1.4	2.4	8.0	4.9	5.3	13.3	5.3	5.6	4.3
	$-CO_3$	290.0	1.2-1.4	5.9	1.7	3.0	1.3	-	3.3	4.1	2.2
O 1s	$-CO_3$, $-CO_2$	531.8	1.6-1.9	18.9	9.1	17.7	14.1	30.2	11.7	24.3	19.6
	-CO	533.4	1.6-1.9	11.6	17.2	12.4	15.6	4.1	14.1	9.4	14.7
F 1s	KF	684-684.5	1.6-1.9	0.7	0.5	0.8	1.7	1.1	2.3	0.43	3.9
	KPF_6 / PF_5	688	1.8-2.1	7.9	2.7	10.0		2.2	4.7	11.8	
	KFSI	688	1.8-2.1				0.9				1.1
	Others	685.2	1.8-2.1	-	2.9	-	2.9	-	-		0.5
P 2p Δ=0.9	KPF_6 / PF_5	137.5	1.1-1.3	1.6	0.5	2.2	-	0.5	0.9	2.6	
N 1s	Salt / degradation		1.5-1.8	-	-	-	0.5/1.4	-	-	-	0.8/1.7
S 2p Δ=1.2	Salt / degradation		1.4-1.6	-	-	-	0.4/2.9/0.9	-	-	-	1.1/3.4/1.6
K 2p	Total	293.5	none	12.7	7.7	16.1	16.4	22.6	9.1	19.8	24.7
Na 1s	Total	1070.9	none	1.3	2.1	0.3	1.0	2.1	1.5	0.4	1.0