Figure S1. Experimental results obtained from Table 1 and FIG. 1 of USP 7,491,471 B2

(A) Design of experiments and (B) dQ/dV data of the 1st charge curve.

(A)

	electrolyte solvents (vol.%)			salt	additive	
	EC	DEC	γ-BL	$LiPF_6$	FEC	$LiBF_4$
No. 1	30	70	-	1.3 mol/L	-	-
No. 2	30	20	50		-	-
No. 3	30	20	50		5 wt.%	-
No. 4	30	20	50		5 wt.%	0.03 mol/L

(B)

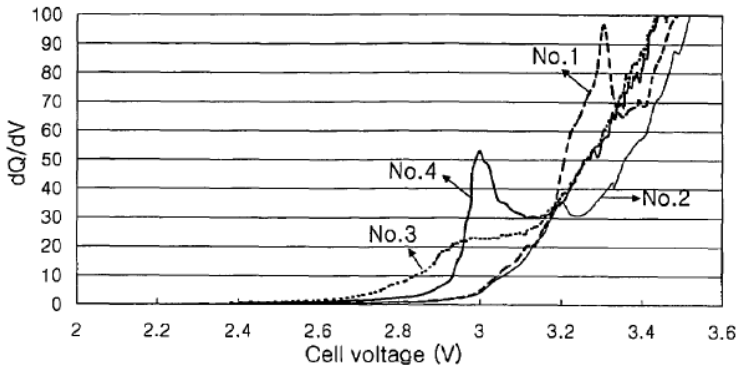

Figure S2. Experimental results obtained from Table 1 and FIG. 2 of USP 7,491,471 B2

(A) Design of experiments and (B) dQ/dV data of the 1st charge curve according to the amount of $LiBF_4$ added.

(A)

	electrolyte solvents		salt	
	EC	DEC	$LiPF_6$	$LiBF_4$
No. 3	30 vol.%	70 vol.%	1.3 mol/L	-
No. 20				0.5 wt.%
No. 21				1.0 wt.%
No. 22				2.0 wt.%

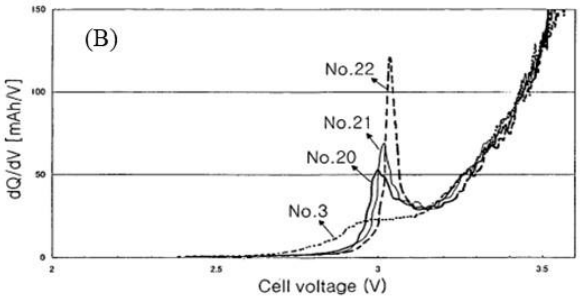

Table S1 from USP 7,491,471 B2

TABLE 1

		Non-aqueous organic solvent (% by volume)					Electrolyte salt		Gelling compound	
		EC	GBL	DEC	FE	Dielectric constant	1st salt	2nd salt	PEGDA	Ester compound
No. 1	Comp. Ex.	30	—	70	—	26	$LiPF_6$ 1.3M	—	—	—
No. 2	Comp. Ex.	30	50	20	—	56	$LiPF_6$ 1.3M	—	—	—
No. 3	Comp. Ex.	30	50	20	—	62	$LiPF_6$ 1.3M	—	—	FEC 5 wt. %
No. 4	Example	30	50	20	—	62	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 5	Example	20	60	20	—	60	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 6	Example	10	70	20	—	58	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 7	Example	—	80	20	—	56	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 8	Example	—	90	10	—	62	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 9	Example	—	100	0	—	68	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 10	Example	—	90		10	62	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 11	Example	—	80		20	56	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 12	Example	—	100		—	68	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	3 wt. %	FEC 5 wt. %
No. 13	Comp. Ex.	—	10	90	—	14	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 14	Comp. Ex.	—	—	100	—	8	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 15	Example	10	70	20	—	61	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 3 wt. %
No. 16	Example	10	70	20	—	64	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 10 wt. %
No. 17	Example	10	70	20	—	76	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	FEC 20 wt. %
No. 18	Example	10	70	20	—	58	$LiPF_6$ 1.3M	$LiBF_4$ 0.01M	—	FEC 5 wt. %
No. 19	Example	10	70	20	—	58	$LiPF_6$ 1.3M	$LiBF_4$ 0.05	—	FEC 5 wt. %
No. 20	Example	10	70	20	—	58	$LiPF_6$ 1.2M	$LiBF_4$ 0.1M	—	FEC 5 wt. %
No. 21	Example	10	70	20	—	58	$LiPF_6$ 0.8M	$LiBF_4$ 0.5M	—	FEC 5 wt. %
No. 22	Example	10	70	20	—	58	$LiPF_6$ 0.3M	$LiBF_4$ 1M	—	FEC 5 wt. %
No. 23	Comp. Ex.	10	70	20	—	58	$LiPF_6$ 1.3M	BETI 0.03M	—	FEC 5 wt. %
No. 24	Comp. Ex.	10	70	20	—	58	$LiPF_6$ 1.3M	BETI 0.05M	—	FEC 5 wt. %
No. 25	Comp. Ex.	10	70	20	—	58	BETI 1.3M	—	—	FEC 5 wt. %
No. 26	Example	10	70	20	—	58	BETI 1.3M	$LiBF_4$ 0.03M	—	FEC 5 wt. %
No. 27	Example	30	50	20	—	54	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	NEC 5 wt. %
No. 28	Example	30	50	20	—	54	$LiPF_6$ 1.3M	$LiBF_4$ 0.03M	—	CEC 5 wt. %

Table S2 from USP 7,491,471 B2

TABLE 2

		100th (%)	2A (charge)	2A (discharge)	Thickness rate at a high temperature	Recovery rate at a high temperature
No. 1	Comp. Ex.	95	Explosion	Explosion	5%	89%
No. 2	Comp. Ex.	42	No explosion	Explosion	30%	65%
No. 3	Comp. Ex.	95	No Explosion	Explosion	50%	32%
No. 4	Example	94	No Explosion	No Explosion	3%	95%
No. 5	Example	94	No Explosion	No Explosion	3%	95%
No. 6	Example	94	No Explosion	No Explosion	3%	95%
No. 7	Example	94	No Explosion	No Explosion	3%	95%
No. 8	Example	93	No Explosion	No Explosion	3%	95%
No. 9	Example	90	No Explosion	No Explosion	3%	95%
No. 10	Example	93	No Explosion	No Explosion	3%	95%
No. 11	Example	93	No Explosion	No Explosion	3%	95%
No. 12	Example	95	No Explosion	No Explosion	1%	98%
No. 13	Comp. Ex.	72	Explosion	Explosion	20%	80%
No. 14	Comp. EX.	55	Explosion	Explosion	40%	72%
No. 15	Example	94	No Explosion	No Explosion	3%	95%
No. 16	Example	95	No Explosion	Rupture	15%	84%
No. 17	Example	95	No Explosion	Rupture	25%	75%
No. 18	Example	95	No Explosion	No Explosion	3%	95%
No. 19	Example	92	No Explosion	No Explosion	3%	95%
No. 20	Example	90	No Explosion	No Explosion	3%	95%
No. 21	Example	85	No Explosion	No Explosion	3%	95%
No. 22	Example	80	No Explosion	No Explosion	3%	95%
No. 23	Comp. Ex.	94	No Explosion	Explosion	50%	50%
No. 24	Comp. Ex.	94	No Explosion	Explosion	50%	50%
No. 25	Comp. Ex.	90	No Explosion	Explosion	50%	32%
No. 26	Example	89	No Explosion	No Explosion	3%	95%

Table S3 from USP 7,223,500 B2

TABLE 1

	Additives	Initial Thickness (mm)	Thickness after high temperature storage (mm)	Thickness variation ratio
Example 1	FEC (2 wt %)	4.15	4.82	116%
Example 2	FEC (2 wt %) VS (0.25 wt %	4.15	4.45	107%
Example 3	FEC (1 wt %) VS (0.25 wt %	4.15	4.29	103%
Example 6	FEC (5 wt %)	4.15	12.81	309%
Example 7	FEC (5 wt %) VS (0.75 wt %	4.15	5.22	126%
Comparative Example 3	No additive	4.15	5.25	127%
Comparative Example 4	VC (5 wt %)	4.15	13.45	324%

Note:
FEC: fluoroethylene carbonate
VS: vinyl sulfone
VC: vinylene carbonate

Table S4. Specifications of LIB components

	Material	Specification
Anode	Graphite	2.5×2.5 cm^2
Cathode	NCM 622	2.0×2.0 cm^2
Reference	Graphite	0.5×2.5 cm^2
Separator	Polyethylene	3.0×3.0 cm^2