Crosslinked Gel Polymer Electrolyte from Trimethylolpropane Triglycidyl Ether by In Situ Polymerization for Lithium-Ion Batteries

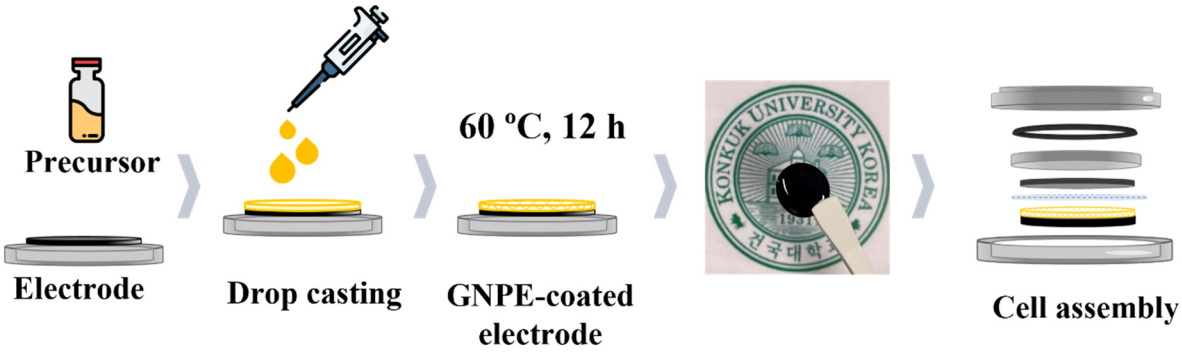


Figure S1. GNPEs preparation and cell assembly structure.

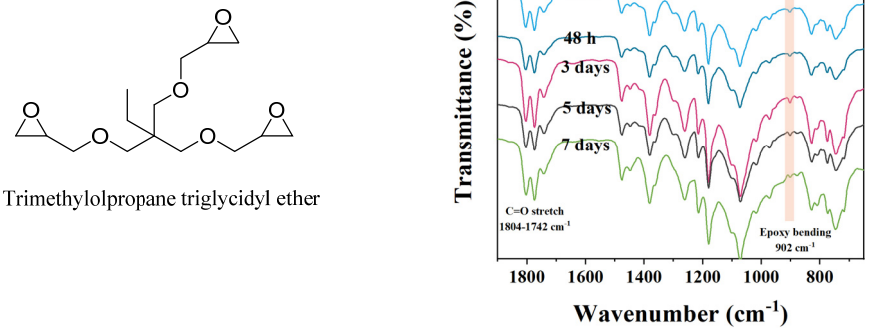


Figure S2. Chemical structure of TMPTE and FT-IR resulting spectra of electrolyte with different times.

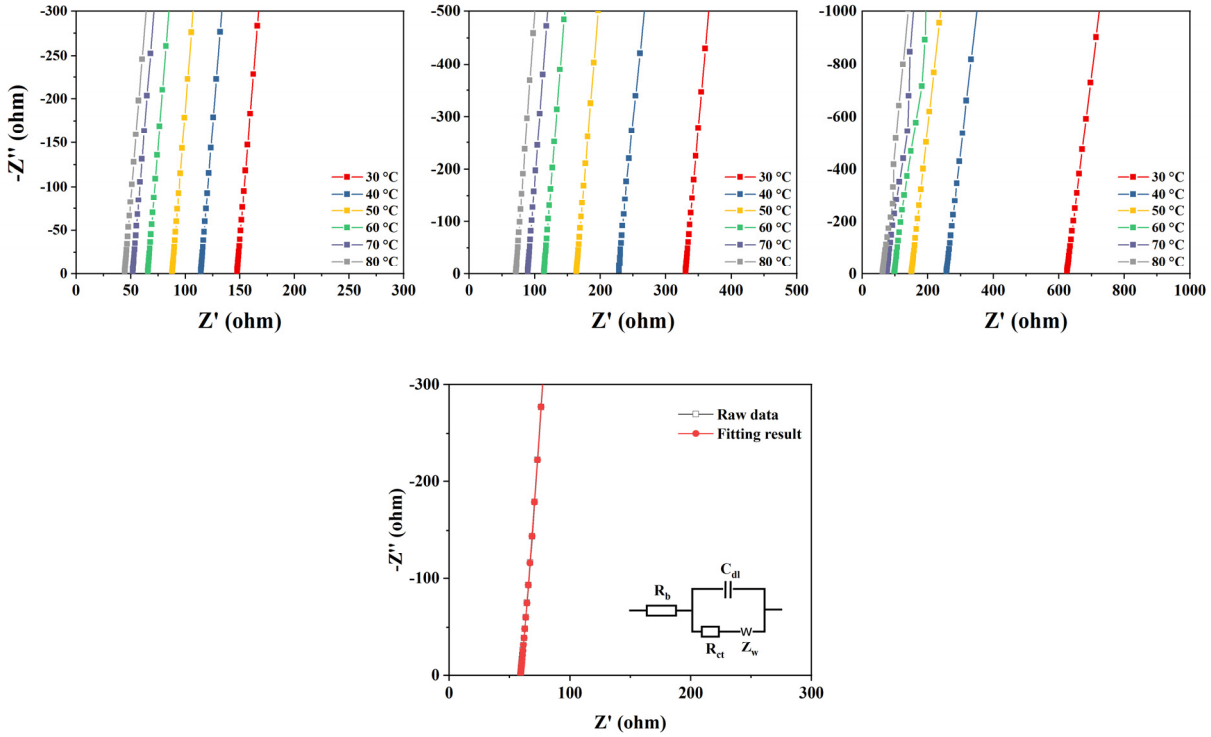


Figure S3. Nyquist plots of electrolytes at various temperatures and equivalent electric circuit model.

Table S1. Currents and resistances of the electrolytes for t_{Li}^{+} calculation.

Electrolyte	Is (A)	I_0(A)	ΔV(mV)	R_0(ohm)	Rs(ohm)	t_{Li}^{+}
GNPE-1	2.18E-06	3.71E-06	0.1	145	213	0.58
GNPE-1.5	9.80E-07	2.11E-06	0.1	320	532	0.46
GNPE-2	1.03E-06	2.39E-06	0.1	640	897	0.42

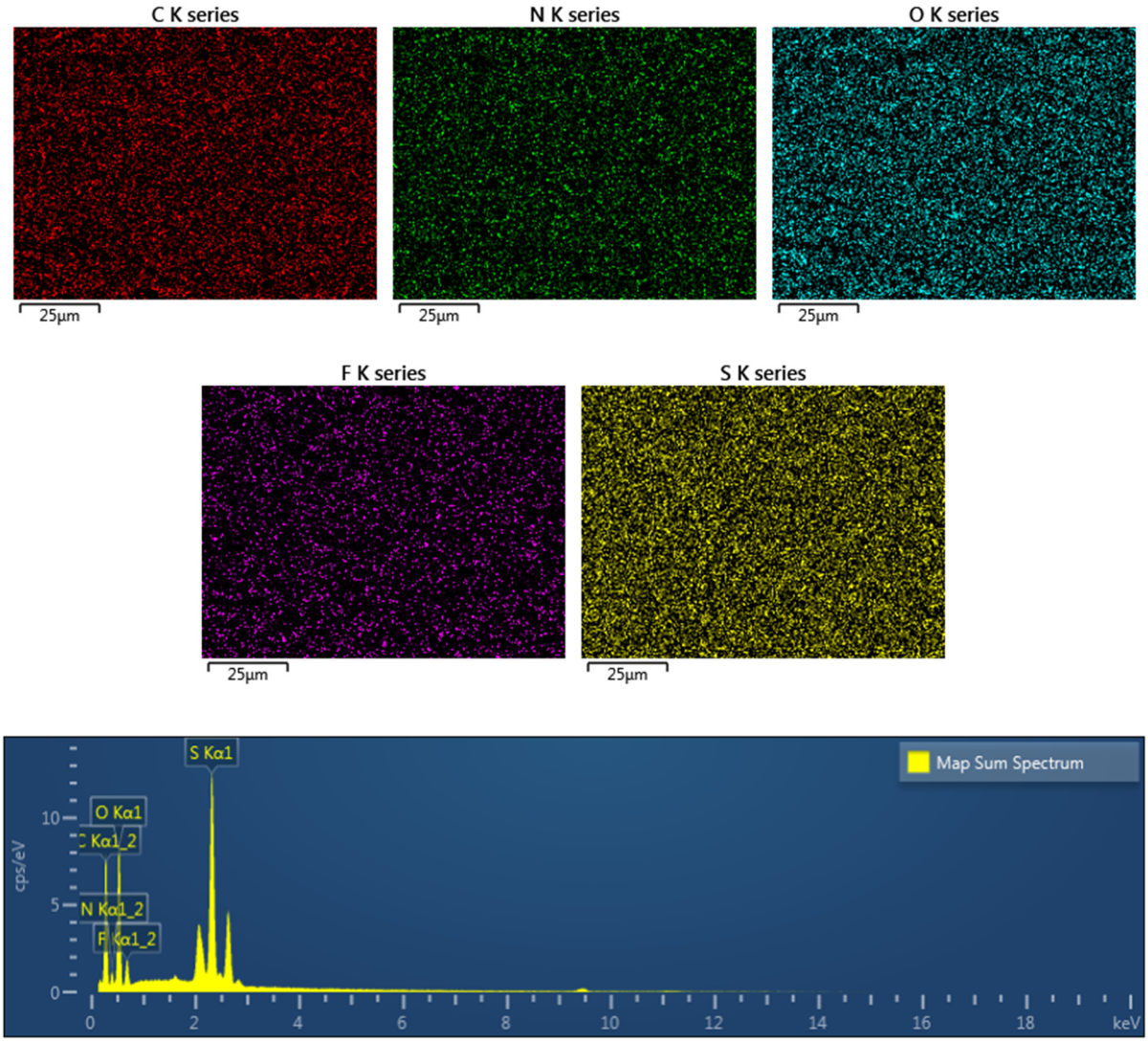
Bruce–Vincent–Evans Equation:

$$t_{Li}^{+} = I_s\,(\Delta V - I_0R_0)/\,I_0\,(\Delta V - I_sR_s)$$

where I_0 and I_s are the initial and steady-state current, and R_0 and R_s are denoted as the interfacial resistance between electrode and electrolyte of the symmetrical cell before and after polarization, respectively.

Table S2. Comparison of electrochemical properties of polymer electrolyte from reported works.

Polymer Electrolyte	**Molecular Structure**	**σ S cm^{-1}**	**t^{+}**	**Ref**
SPE	PGO	2.56×10^{-8}	0.549	[1]
	HPGO	4.07×10^{-7}	0.693	
In situ gel polymer	PGTE	4.16×10^{-4}	0.122	[2]
In situ polymer	PSEPE	1.16×10^{-4}	0.61	[3]
SPE	PGA	5.61×10^{-4}	0.43	[4]
GPE	DGEBA/L LTO	2.02×10^{-3}	0.82	[5]
GPE	TiO_2/Epoxy-based composite	1.1×10^{-4}	0.661	[6]
In situ gel polymer	GNPE-1	2.63×10^{-4}	0.58	This work
	GNPE-1.5	1.17×10^{-4}	0.46	
	GNPE-2	6.21×10^{-5}	0.42	



Element	Wt.%	Wt.% Sigma
C	42.71	0.54
N	11.3	0.7
O	30.37	0.43
F	5.37	0.21
S	10.24	0.14
Total:	100	

Figure S4. Elemental mapping and EDS analysis of GNPE-1.

References

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