Electronic Supplementary Information for the Manuscript Entitled:

A novel composite polymer electrolytes containing poly(ethylene glycol)-grafted graphene oxide for all-solid-state lithium-ion battery applications

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	Resistivity (ohm/sq)
GO	3.2×10^{8}
PGO	1.0×10^{8}
BCP-GO (10 wt%)	2.1×10^{10}
BCP-PGO (10 wt%)	1.4×10^{10}

Table S1 Electrical sheet resistivities of GO, PGO, BCP-GO (10 wt%), and BCP-PGO (10 wt%).

Samples	**t_{ion} (%)** [a]	**t_{ele} (%)** [b]	**Electronic conductivity (S/cm)**
BCP	99.9999	0.0001	5.6×10^{-12}
BCP-PGO 0.2 wt%	99.9999	0.0001	1.3×10^{-11}
BCP-PGO 0.5 wt%	99.9999	0.0001	2.4×10^{-11}
BCP-PGO 1.0 wt%	99.9999	0.0001	1.7×10^{-11}
BCP-PGO 3.0 wt%	99.9999	0.0001	2.9×10^{-11}
BCP-PGO 10 wt%	99.9998	0.0002	2.8×10^{-11}

[a] Determined by DC polarization method; t_{ion} (%) = $100(I_t-I_e)/I_t$. [b] Determined by DC polarization method; t_{ele} (%) = $100I_e/I_t$.

Table S2 Ionic/electronic transport numbers and electronic conductivities of BCP and BCP-PGOs containing various PGO contents estimated by DC polarization method.

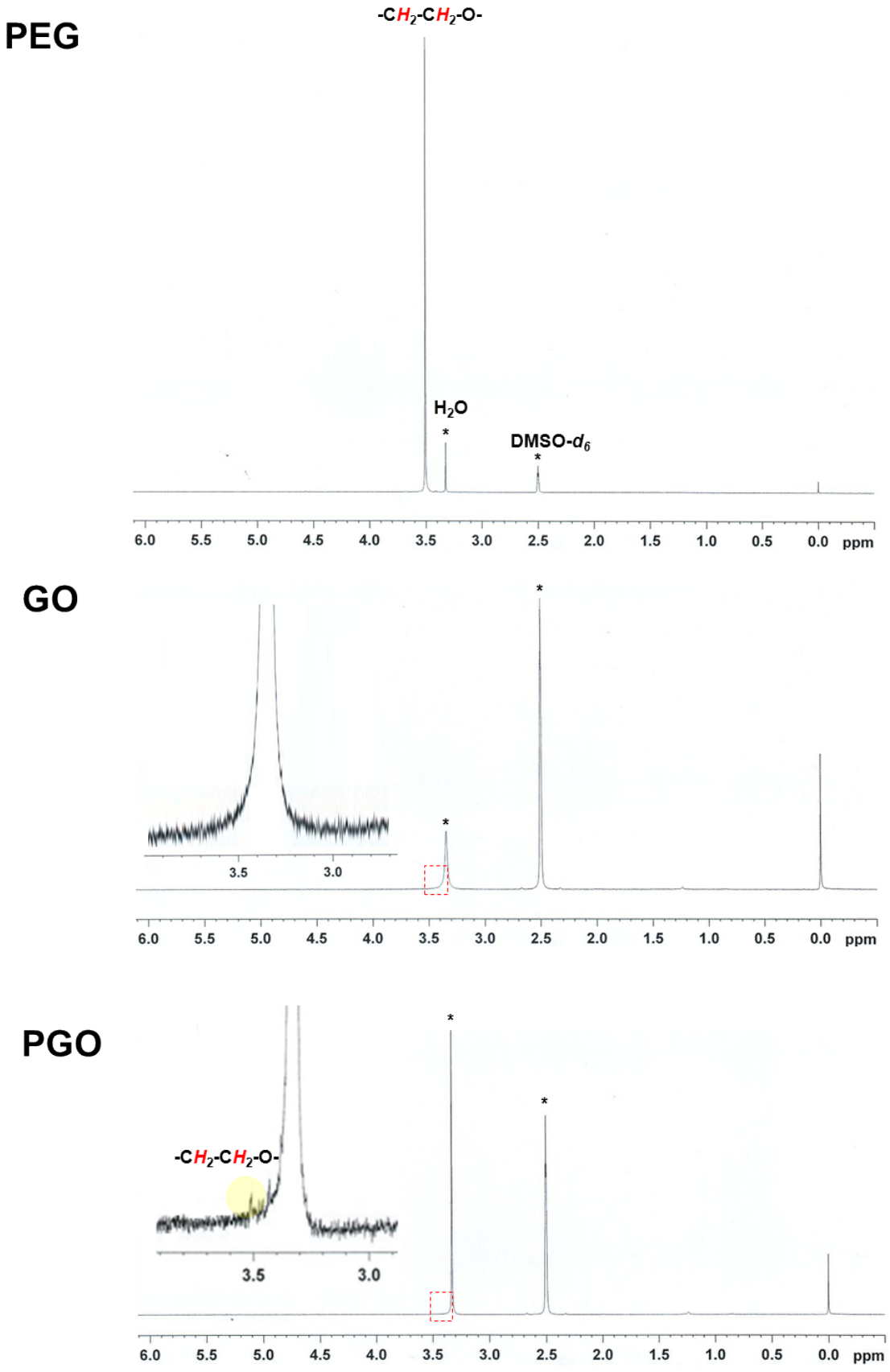


Fig. S1 ^{1}H NMR spectra of PEG and PGO.

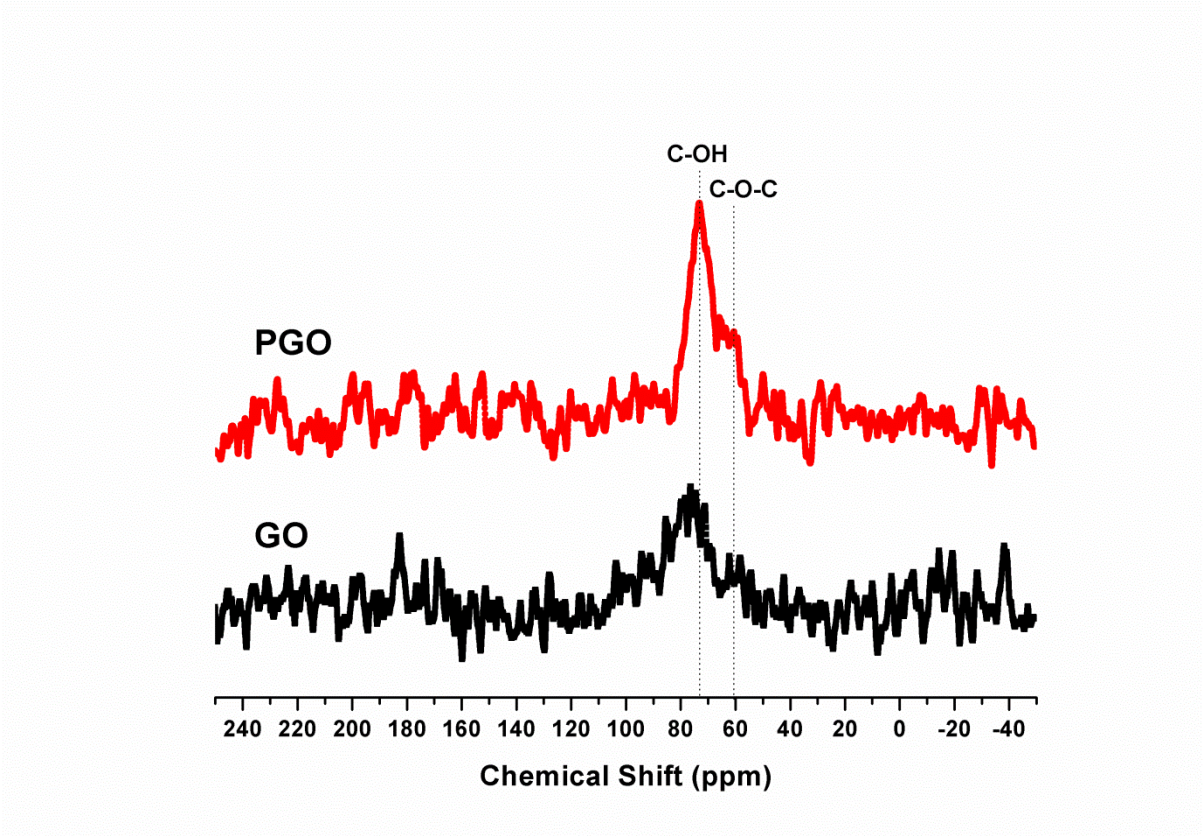
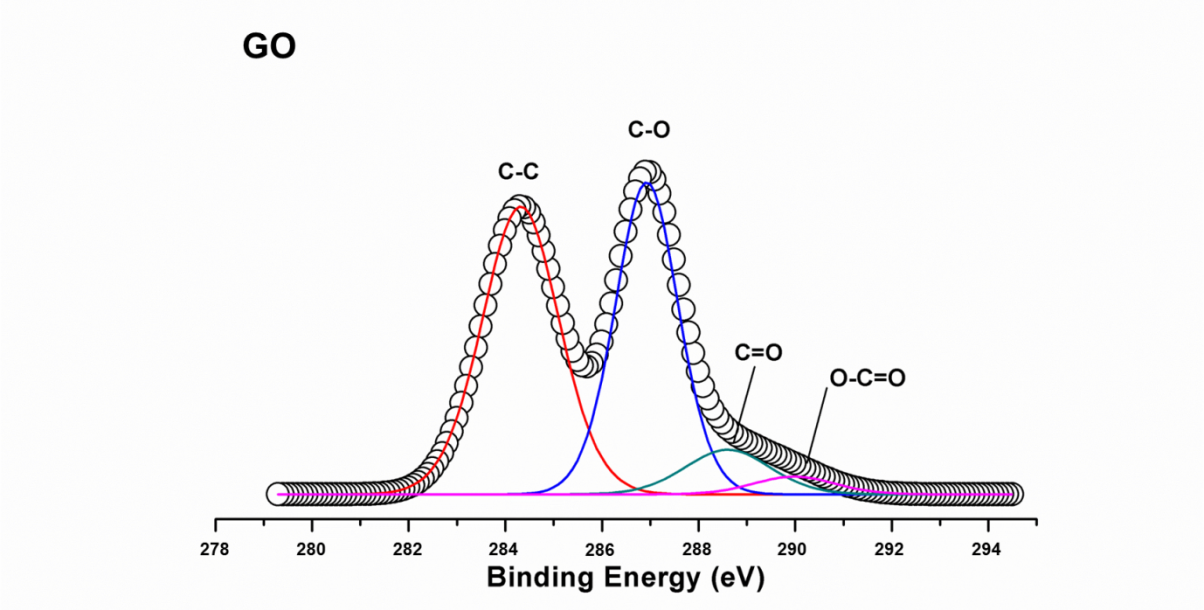


Fig. S2 Solid-state ^{13}C MAS NMR spectra of GO and PGO

(a)



(b)

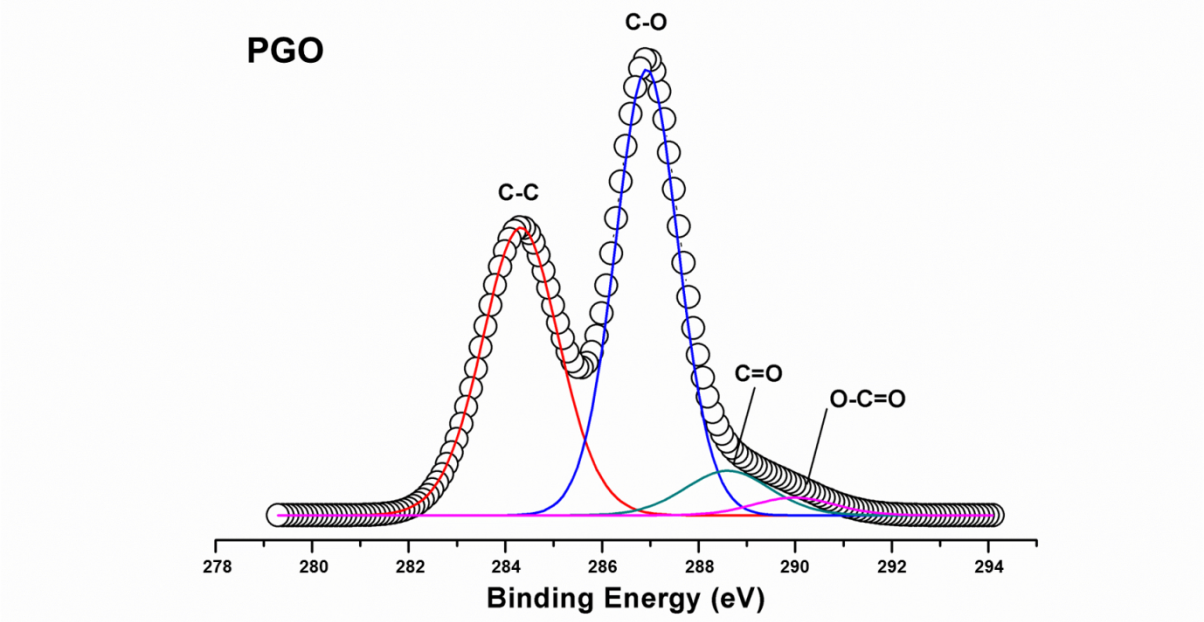


Fig. S3 X-ray photoelectron spectroscopy (XPS) C1s spectra of (a) GO and (b) PGO.

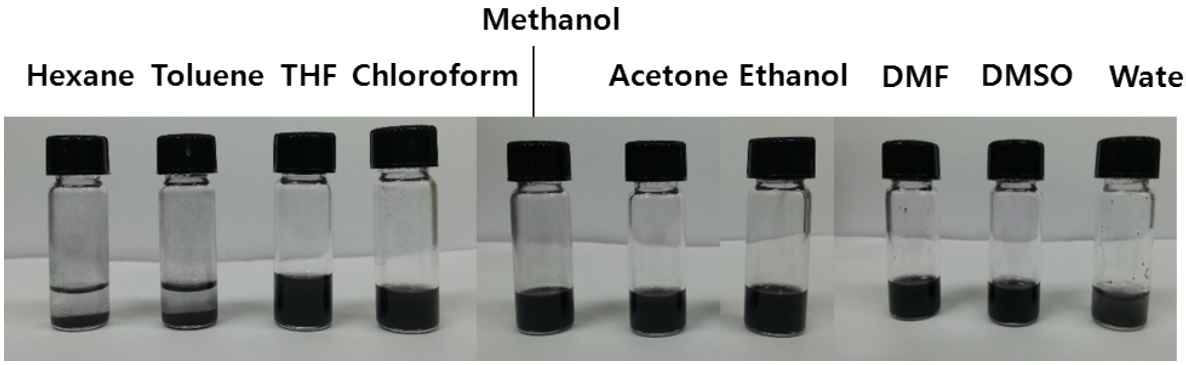


Fig. S4 Dispersion behavior of PGO in various kinds of organic solvent. ([PGO] = 5 mg mL^{-1})

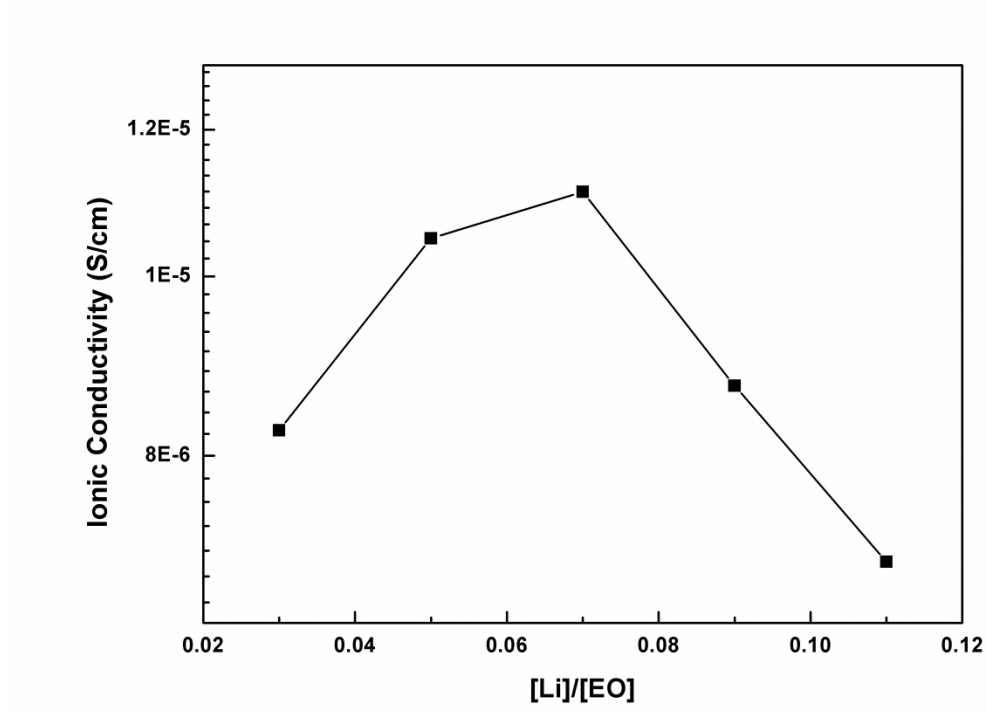
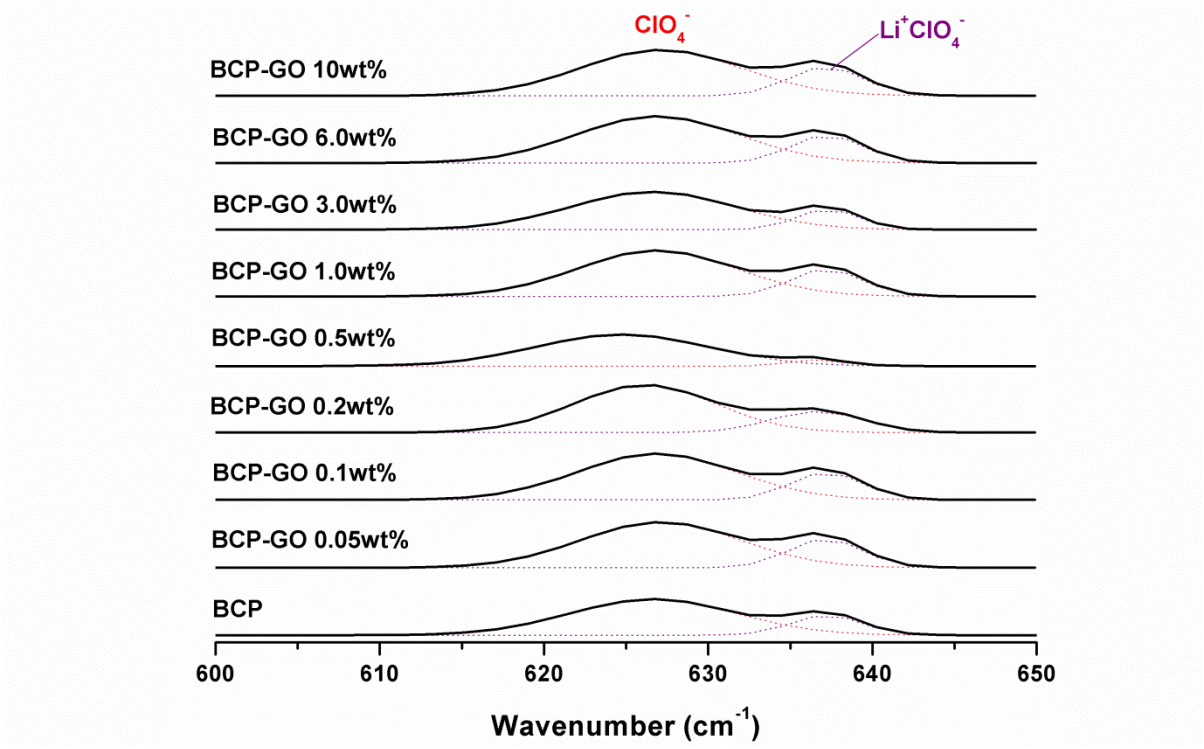


Fig. S5 Ionic conductivities of BCP containing $LiClO_4$ with various concentrations at 30 ^oC.

Fig. S6 Photographs of composite polymer electrolytes containing 0.2, 0.5, 1.0, and 3.0 wt%

of PGO ([Li]/[EO] = 0.07).

(a)



(b)

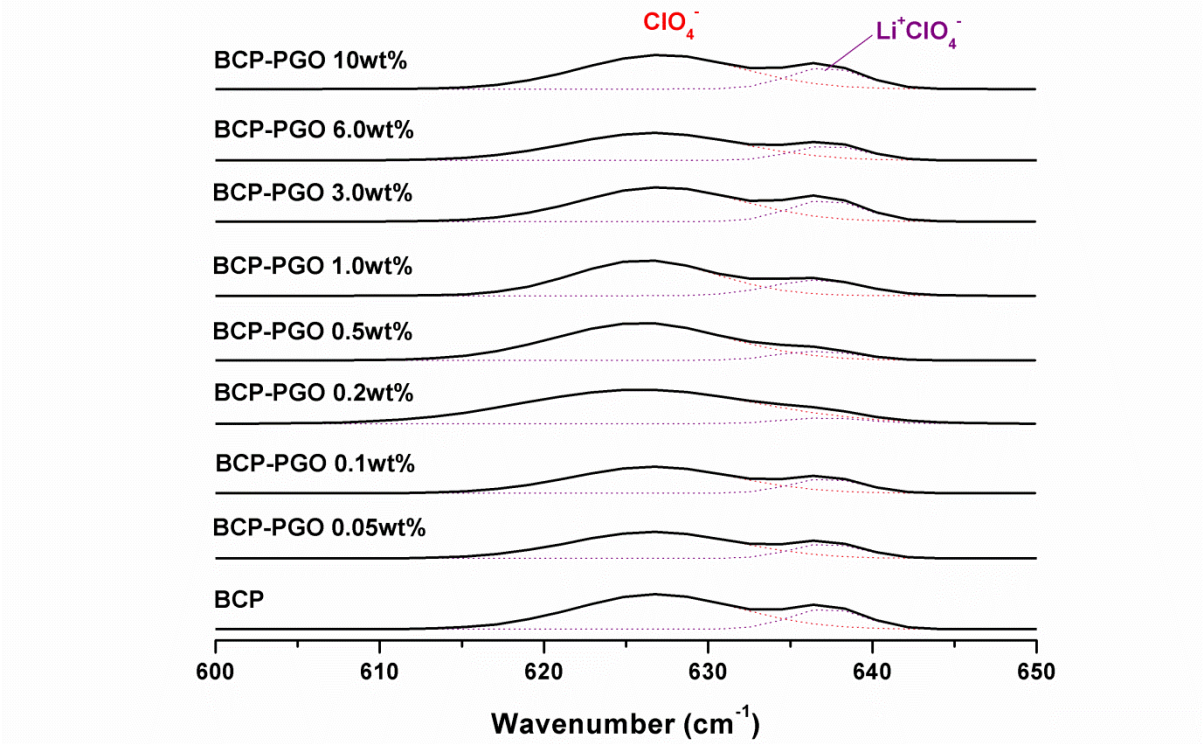
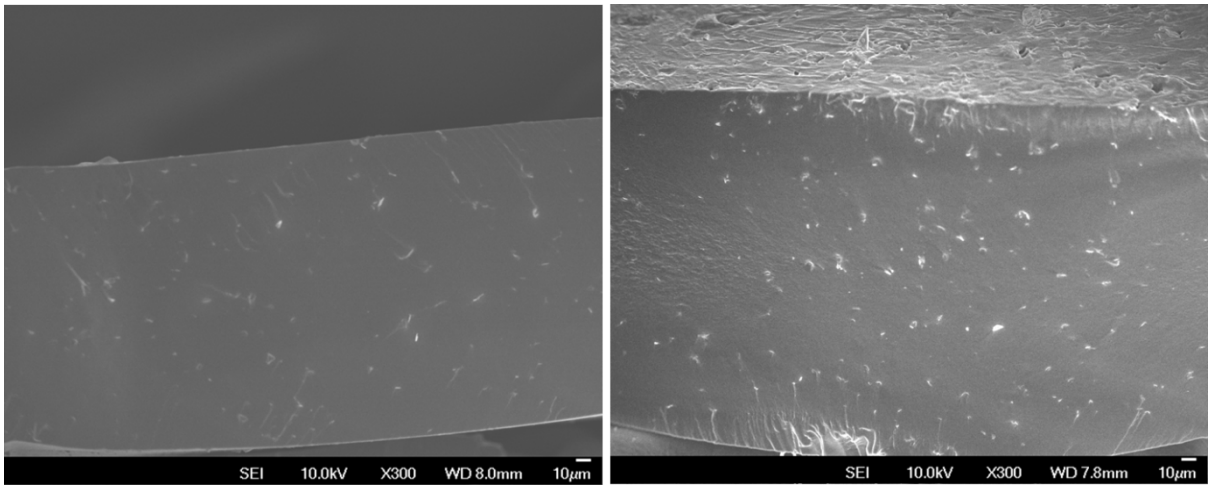


Fig. S7 FT-IR spectra of (a) BCP-GO and (b) BCP-PGO with different filler content.

(a) (b)



(c) (d)

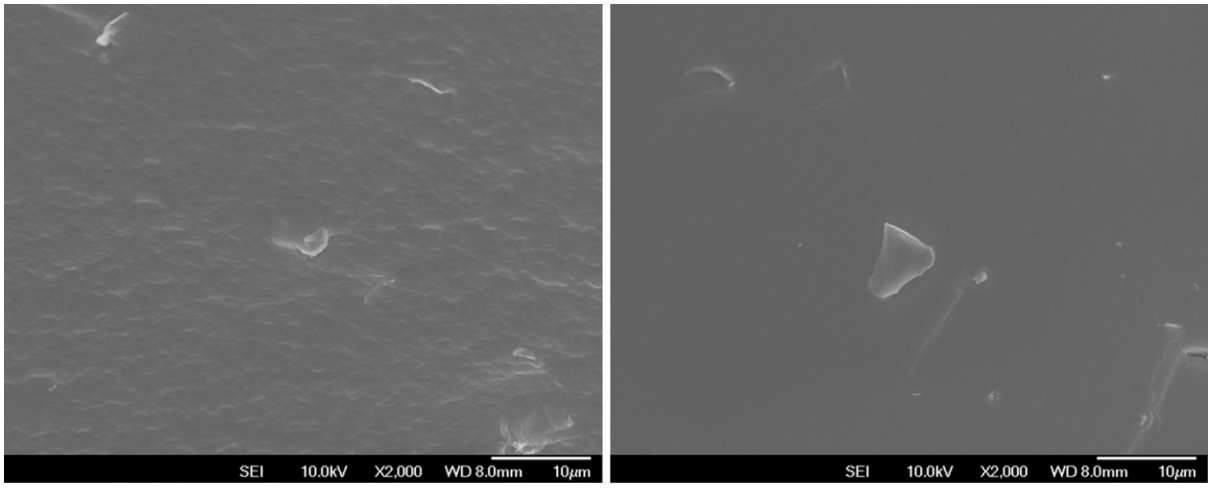
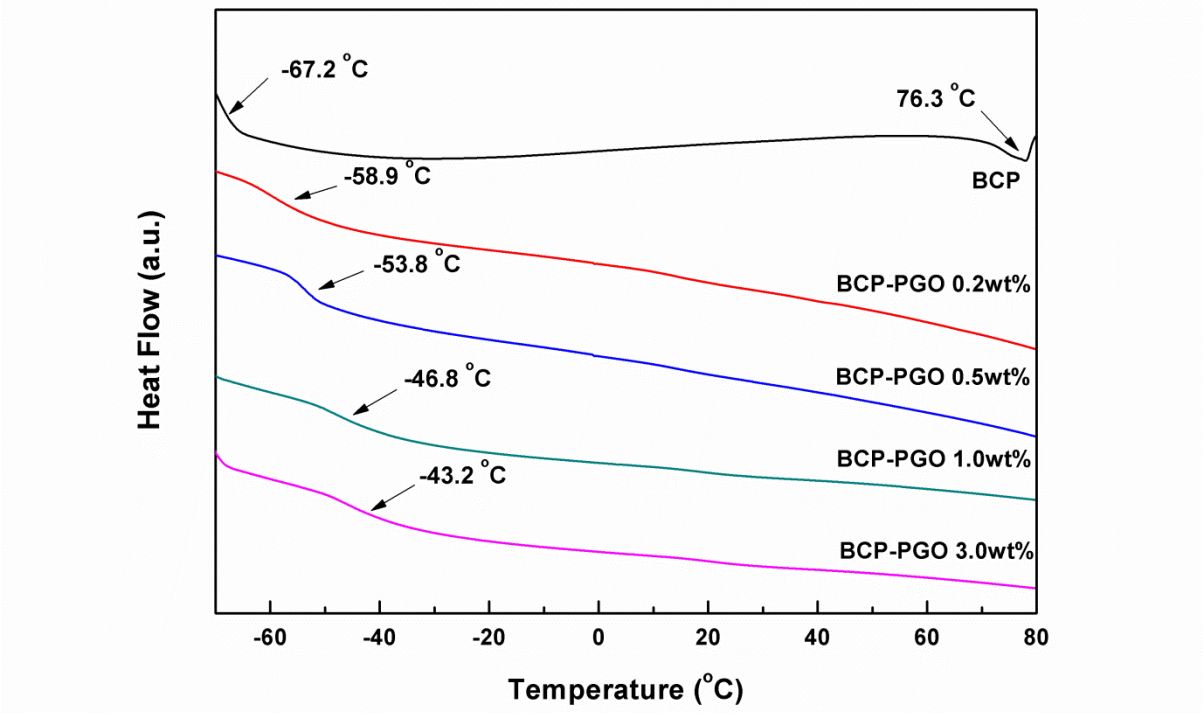


Fig. S8 Cross-sectional SEM images of (a) BCP-PGO (×300), (b) BCP-GO (×300), (c) BCP-PGO (×2000), and (d) BCP-GO (×2000) composite polymer electrolyte (filler content = 3.0 wt%).

(a)



(b)

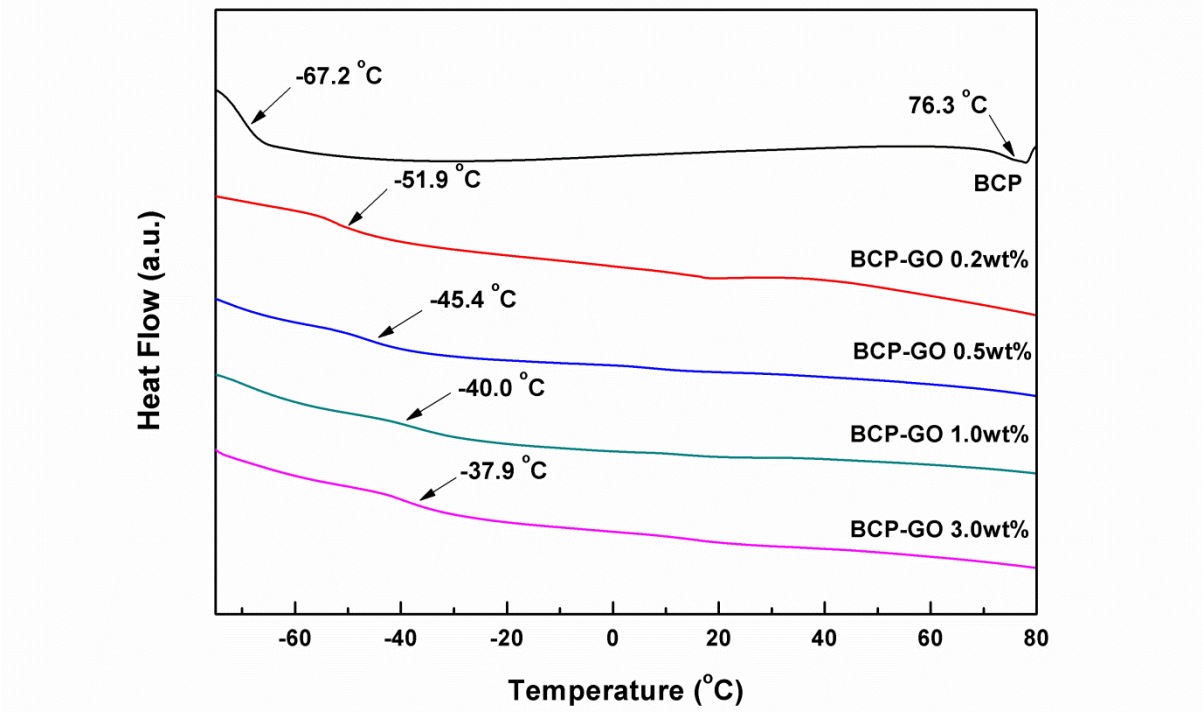


Fig. S9 DSC thermograms of BCP and composite polymer electrolytes containing various content of (a) PGO and (b) GO.

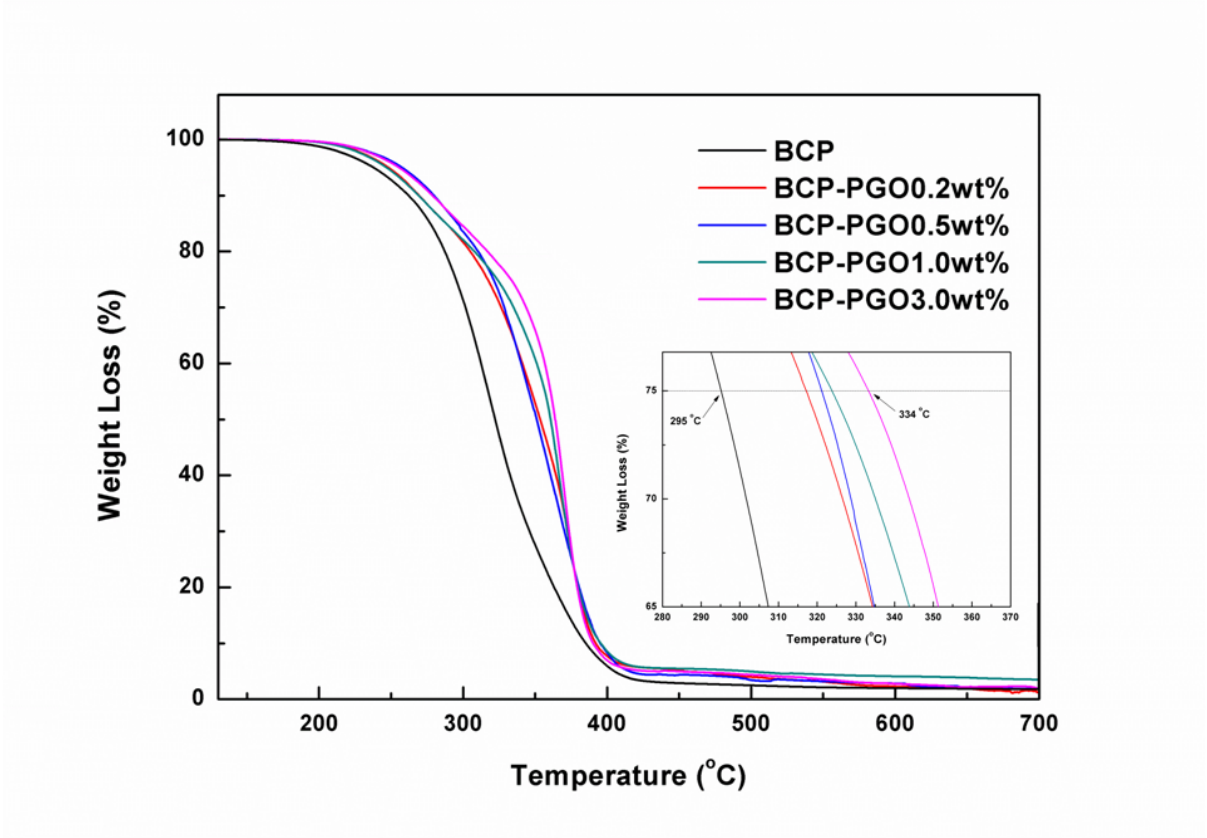


Fig. S10 TGA profiles of BCP and composites polymer electrolytes with different PGO content. (Inset is a magnified view of the temperature region from 280 °C to 370 °C.)

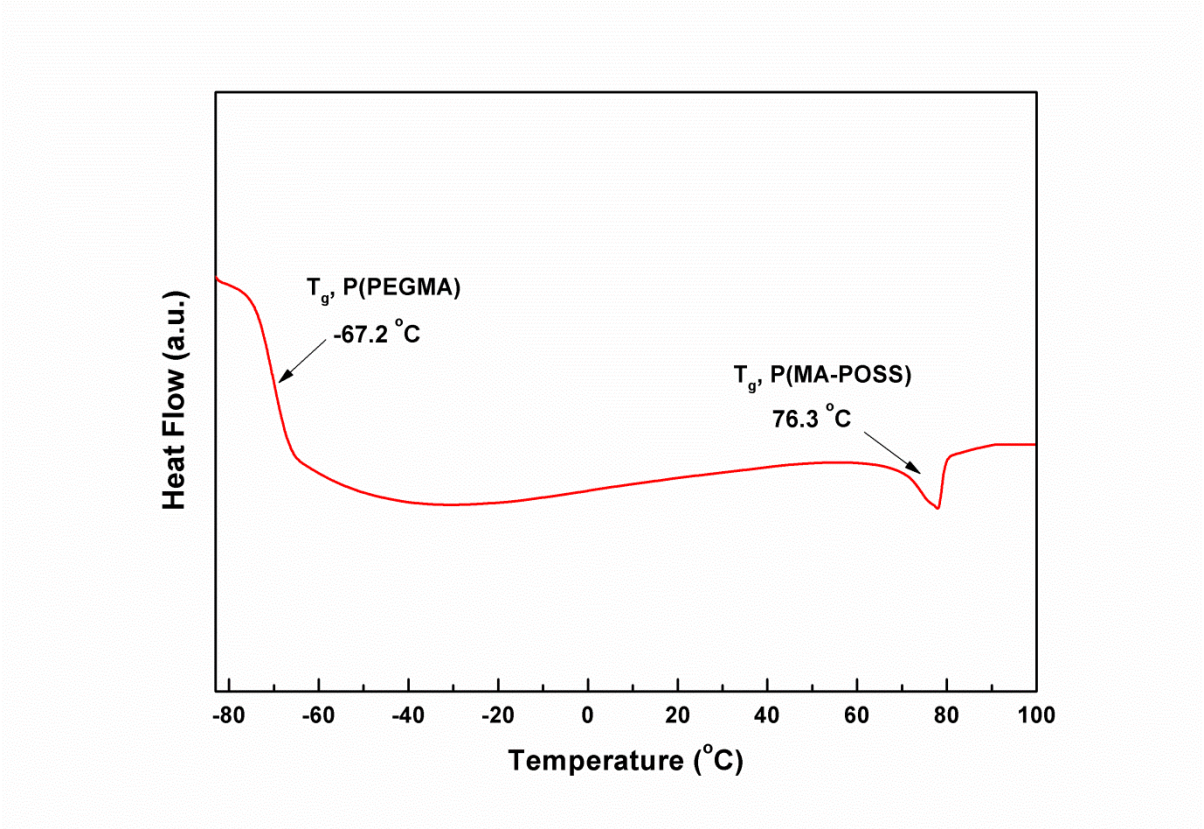
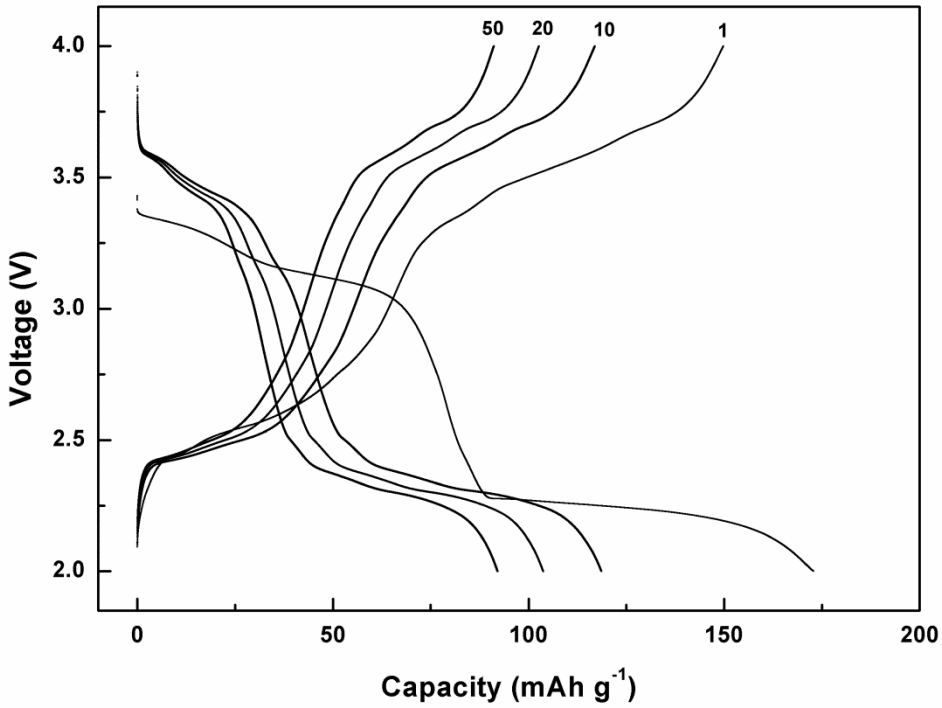


Fig. S11 DSC thermogram of BCP.

(a)



(b)

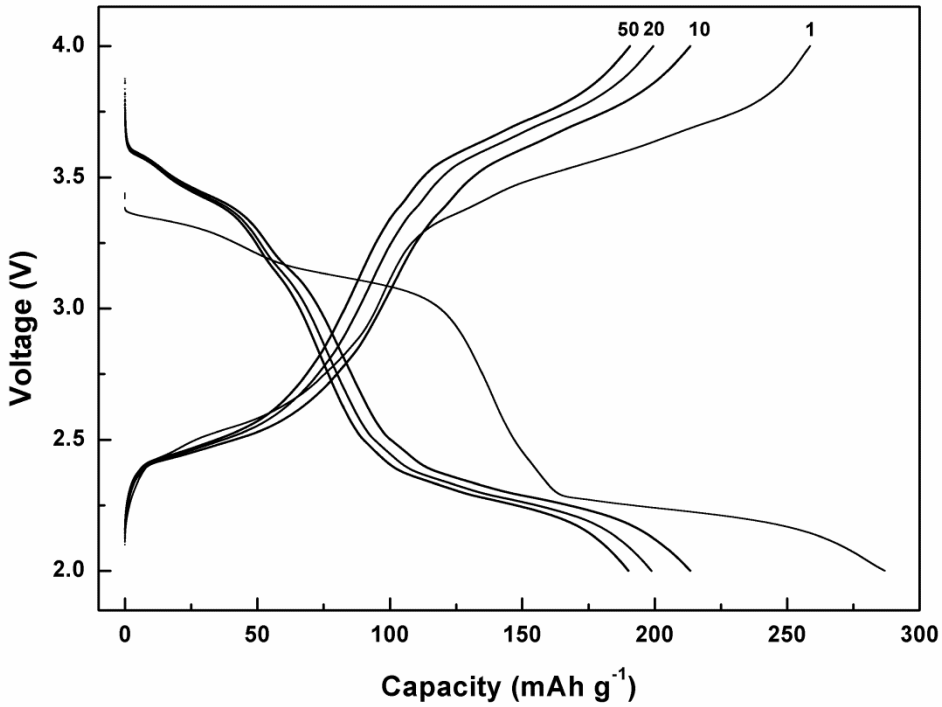


Fig. S12 Charge/discharge curves of all-solid-state (a) Li/BCP/V_2O_5, (b) Li/BCP-PGO(0.2 wt%)/V_2O_5 cell cycled at 60 ^oC (0.1C).