Electronic Supplementary Information

Gel Composite Electrolyte - An Effective Way to Utilize Ceramic Fillers in Lithium Batteries

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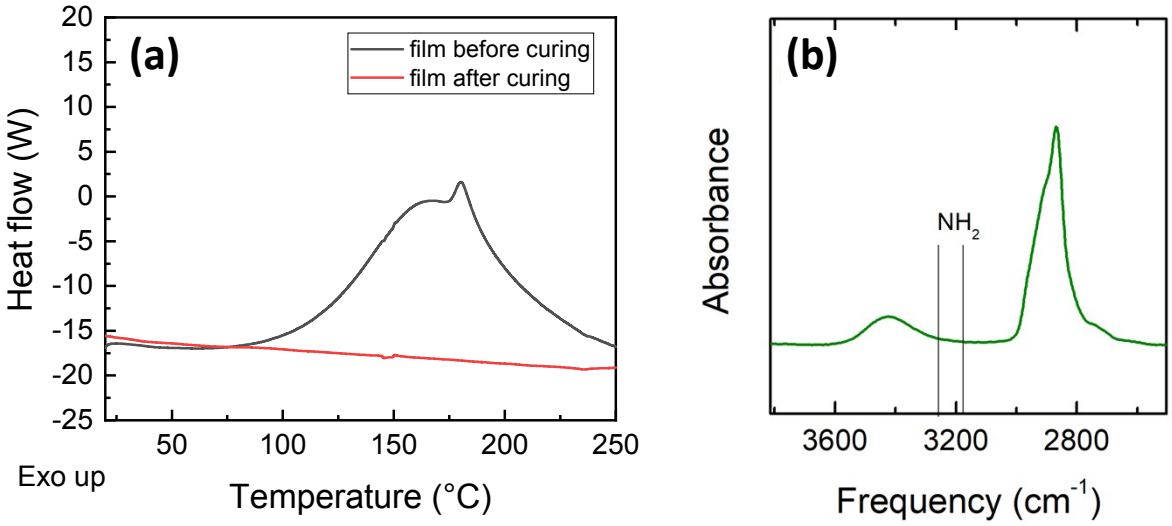

Fig. S1 (a) Differential scanning calorimetry (DSC) thermograms of polymer and composite electrolyte films before and after curing. A large exothermic peak was observed for the uncured film. After curing, the exothermic peak disappeared, indicating completion of the crosslinking reaction. (b) Infrared spectrum of cured polymer electrolyte film, indicating that all NH_2 groups have reacted, and likely all NH groups. The broad stretching vibrations of OH and NH begin to overlap in the 3370 cm^{-1} to 3400 cm^{-1} regions.

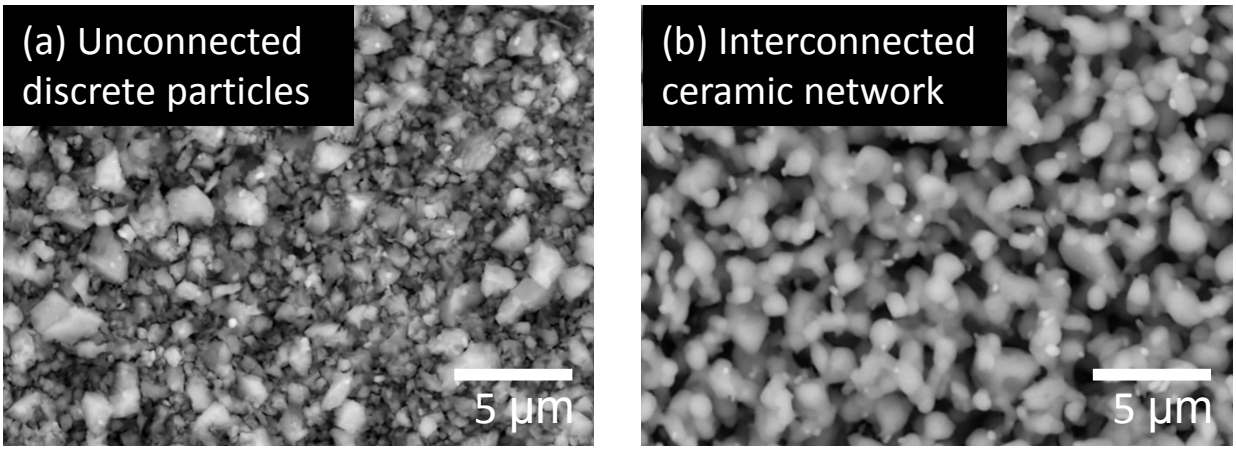

Fig. S2 SEM images showing the morphology differences between (a) densely packed but unconnected discrete LICGC™ particles and (b) partially sintered and interconnected LICGC™ ceramic network.

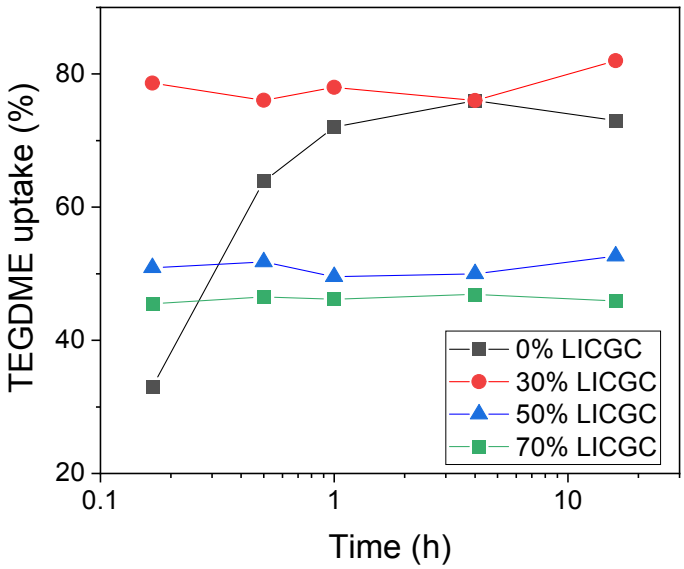

Fig. S3 Tetraethylene glycol dimethyl ether (TEGDME) uptake of the polymer and composite electrolyte membranes as a function of time. The thinner composite membranes with less than 100 μm thickness reached saturated uptake within 10 min. The thicker pristine polymer membrane reached saturated uptake in 1 hour.

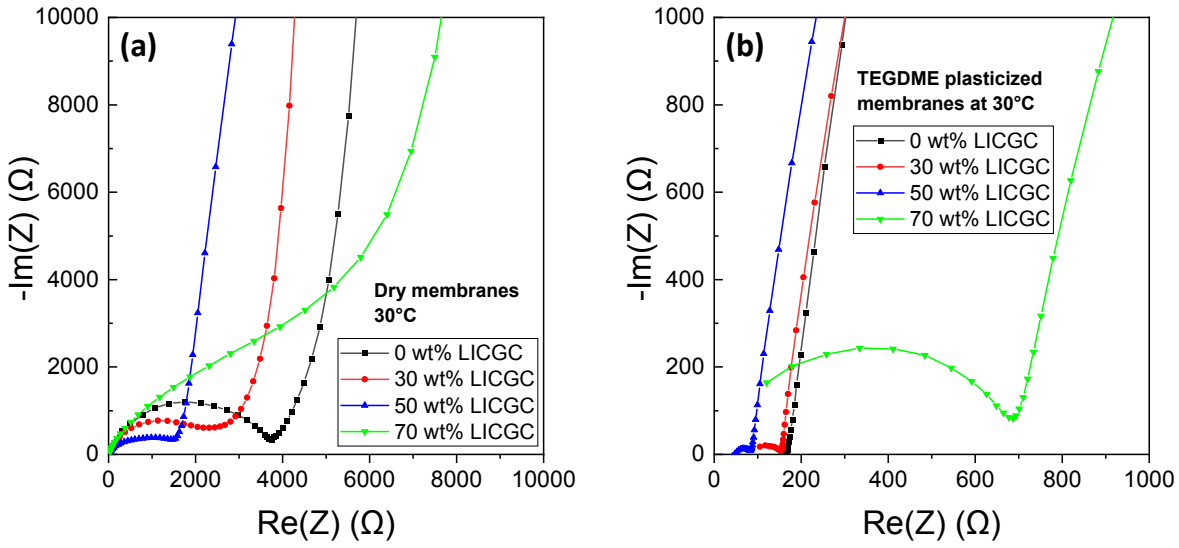

Fig. S4 Representative Nyquist plot of dry (a) and TEGDME plasticized (b) polymer and composite electrolyte membranes at 30 ℃, with stainless steel blocking electrodes.

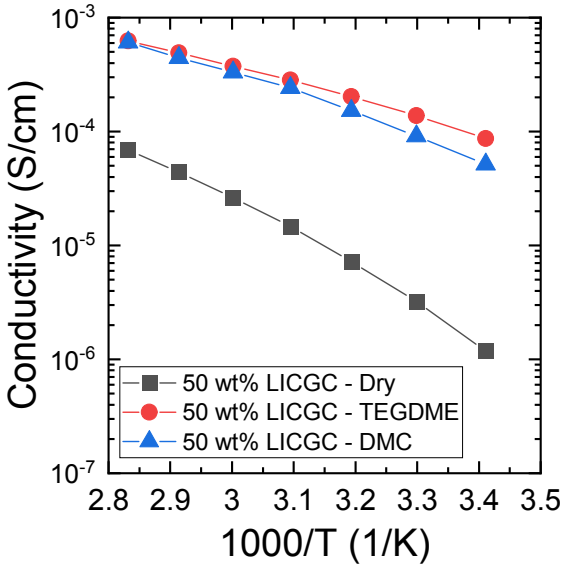

Fig. S5 Ionic conductivity of composite electrolyte membrane containing 50 wt% LICGC (dry weight) as a function of inverse temperature. Black curve, dry membrane; red curve, plasticized with TEGDME; and blue curve, plasticized with dimethyl carbonate (DMC). Similar conductivity was observed in the two plasticizers.

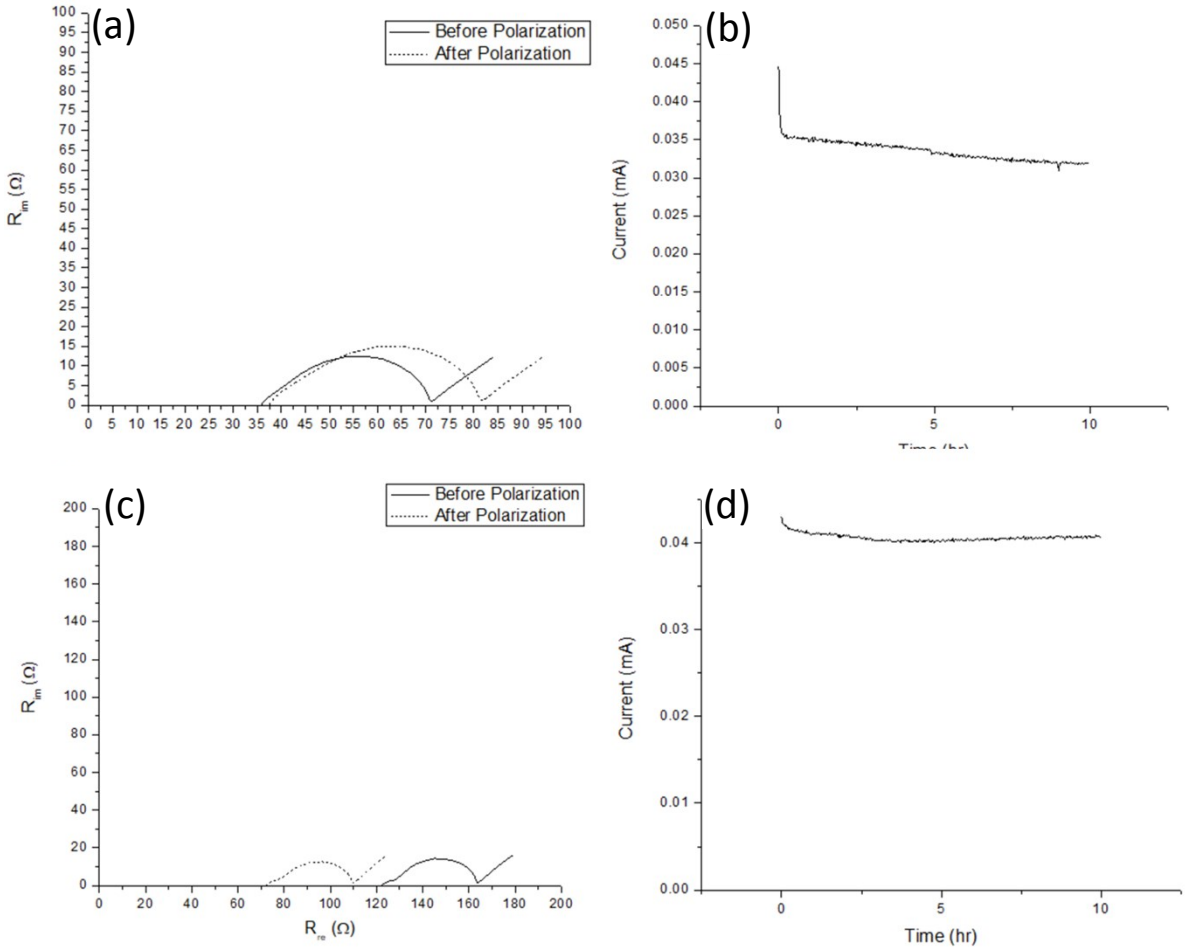

Fig. S6 Details of Li^+ transference number measurements. (a,b), EIS (a) and polarization (b) of film with 0 wt% ceramic loading. (c, d), EIS (c) and polarization (d) of film with 50 wt% ceramic loading.