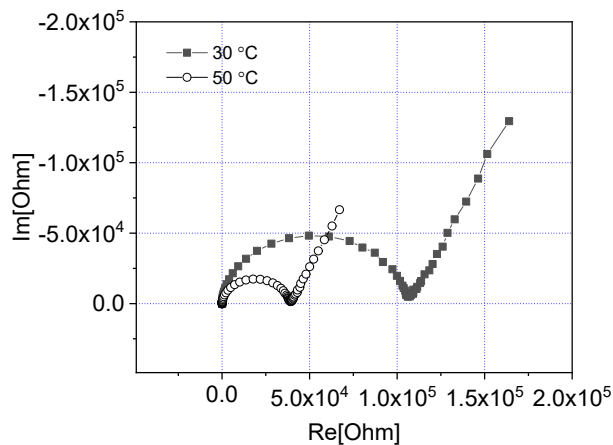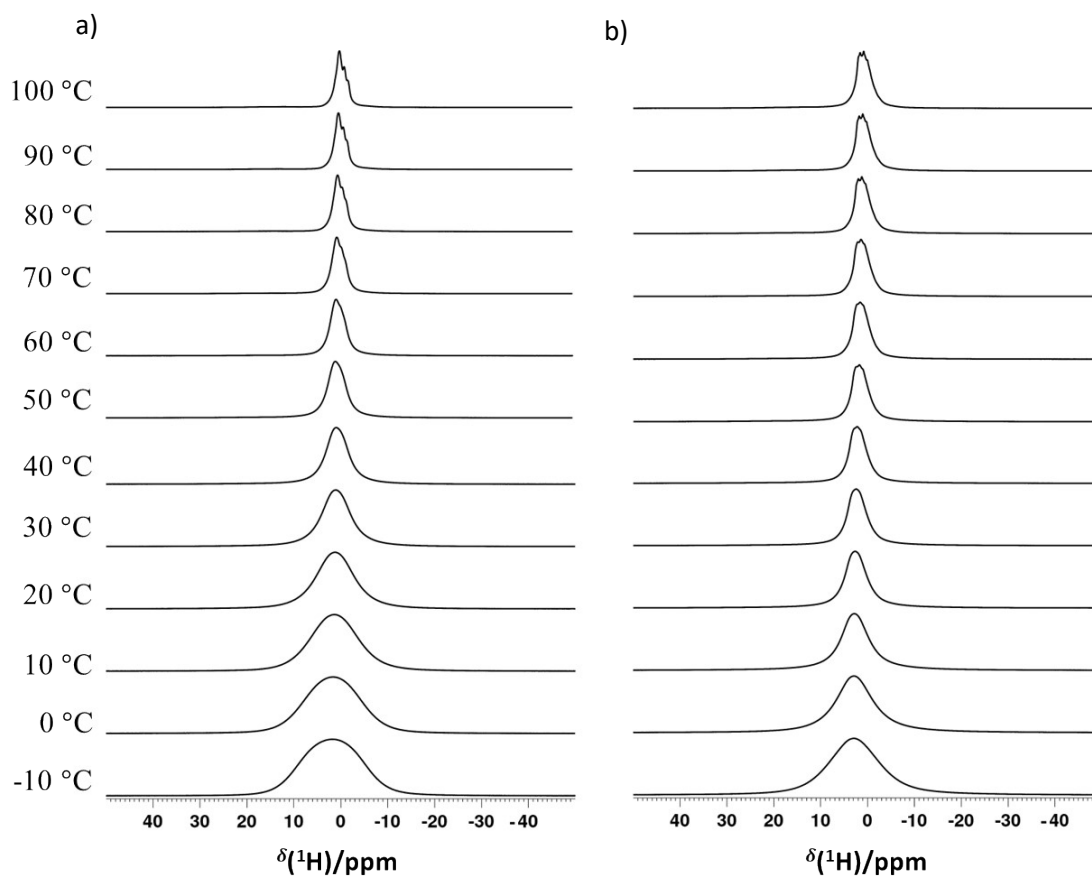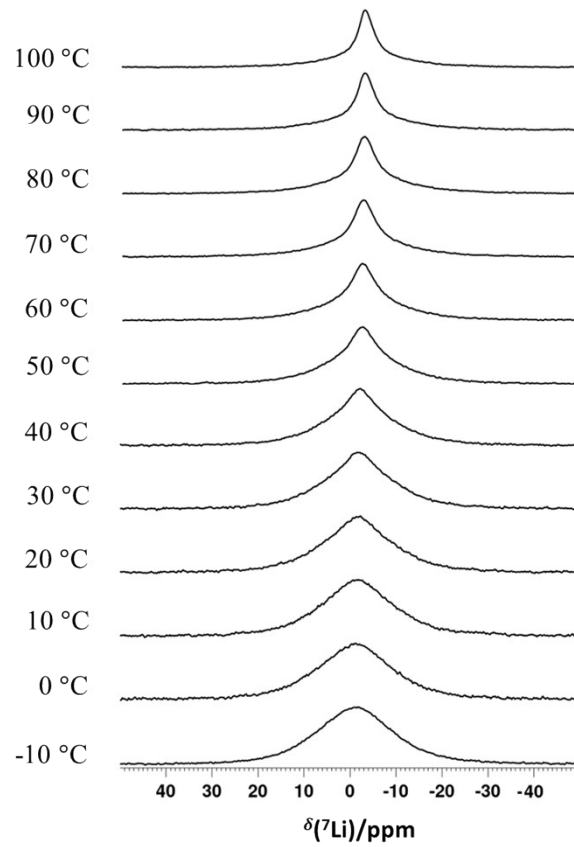SUPPORTING INFORMATION

**S1** Nyquist plot of EIS spectra of the composite with 20 v% polymer particles as prepared at 30 °C and 50 °C.



**S2** Static $^1$H NMR with variable temperature experiments of a) C$_2$mpyrFSI and b) composite with 20v% of polymer nanoparticles (CF-20-NPs).
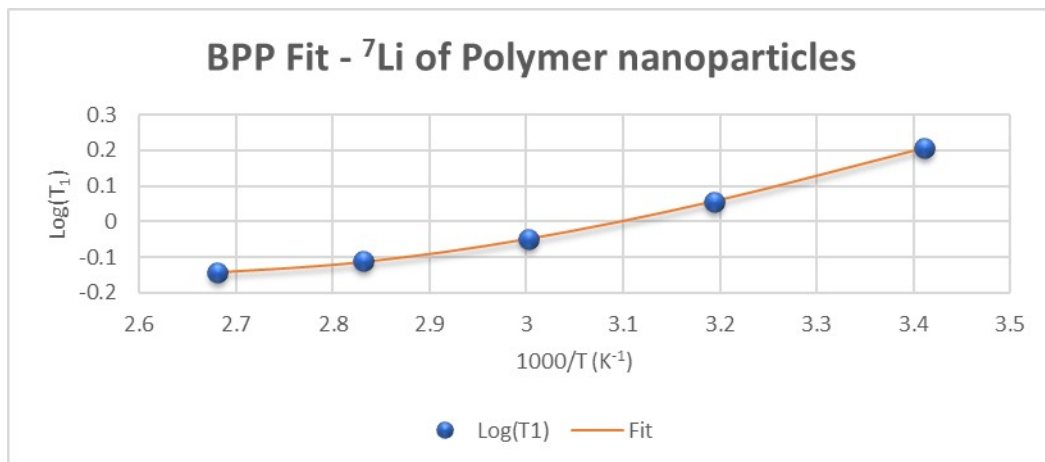
**S3** Static $^7Li$ NMR with variable temperature experiments of the composite with 20 v% of polymer nanoparticles (CF-20-NPs).



**S4** $^7Li$ $T_1$-BPP Fit for a) polymer nanoparticles and b) composite with 20 v% of polymer nanoparticles (CF-20-NPs).

a)

b)C



BPP Fit - $^7$Li of CF-20-NPs-(95)