Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information

High ionic conductive, freezing-resistant and transparent polyurethane based on a novel metal ionic deep eutectic solvent

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1. Synthesis and Characterization of CPU

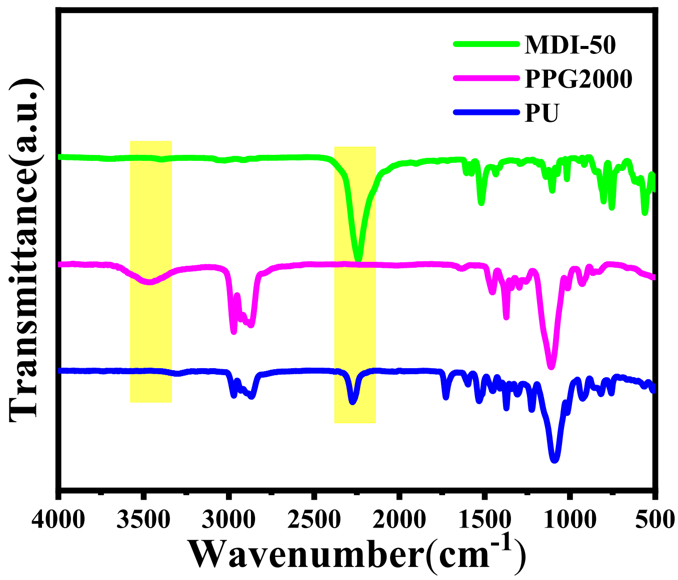

Figure S1. FTIR spectra of MDI-50, PPG2000 and polyurethane prepolymer.

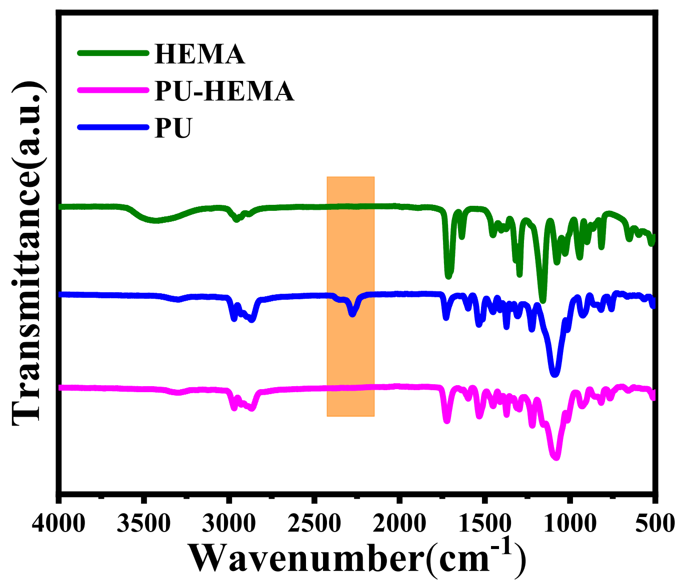

Figure S2. FTIR spectra of PU, HEMA and PU-HEMA.

Figure S3. The photos of the CPU-5 without and with the addition of AA.

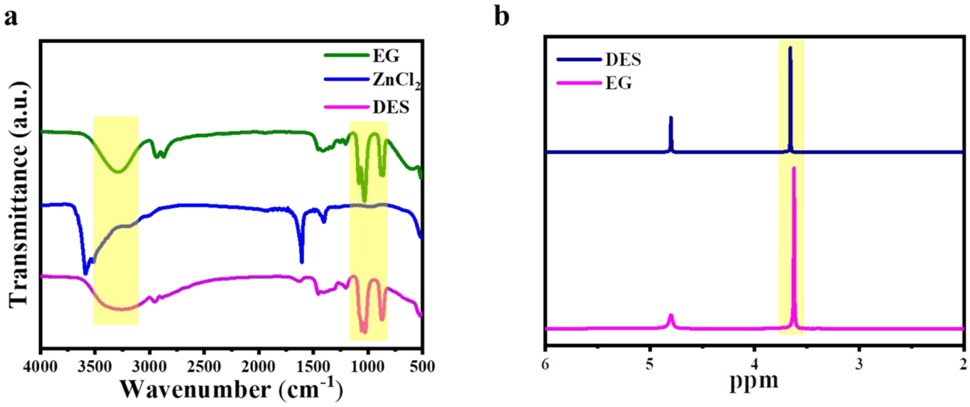

Figure S4. (a) The FTIR spectra of DES, $ZnCl_2$ and EG. (b) The ^{1}H NMR spectra of DES and EG.

2. Mechanical Property of CPU

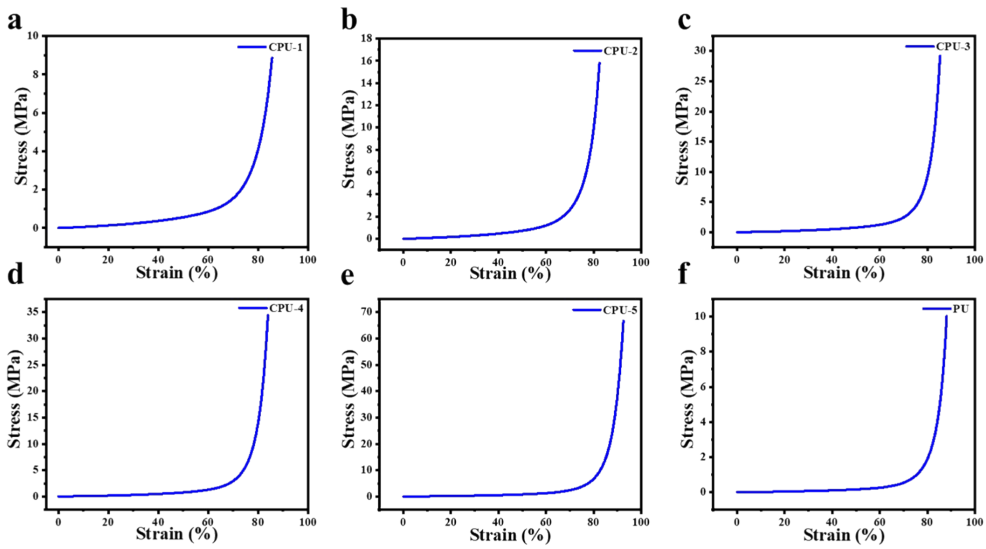

Figure S5. Stress-strain curves of CPUs 1-5 and PUs: (a) CPU-1, (b) CPU-2, (c) CPU-3. (d) CPU-4, (d) CPU-5, (f) PU.

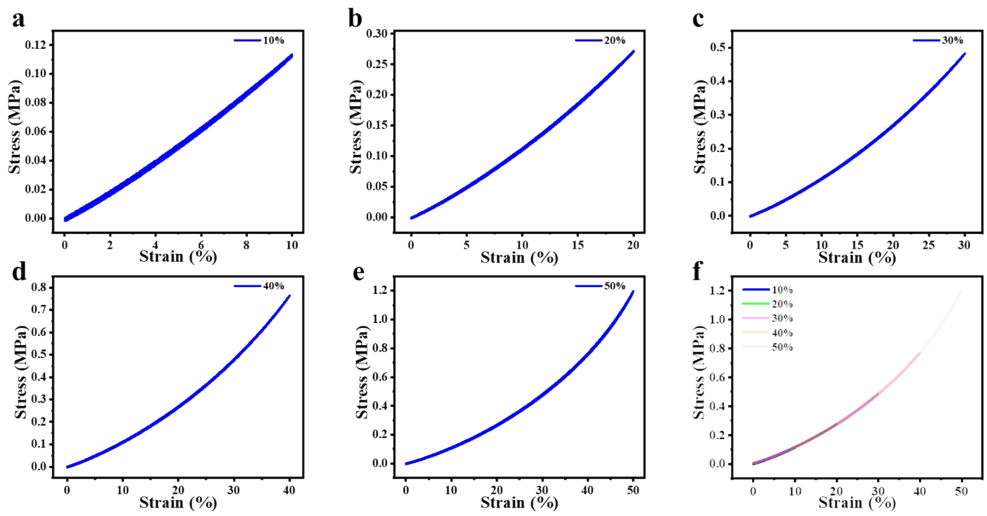

Figure S6. 10-50% cyclic compression stress-strain curves for CPU-5: (a) 10%, (b) 20%, (c) 30%, (d) 40%, (d) 50%, (f) comparison of cyclic compressive stress-strain curves at each loading strain.

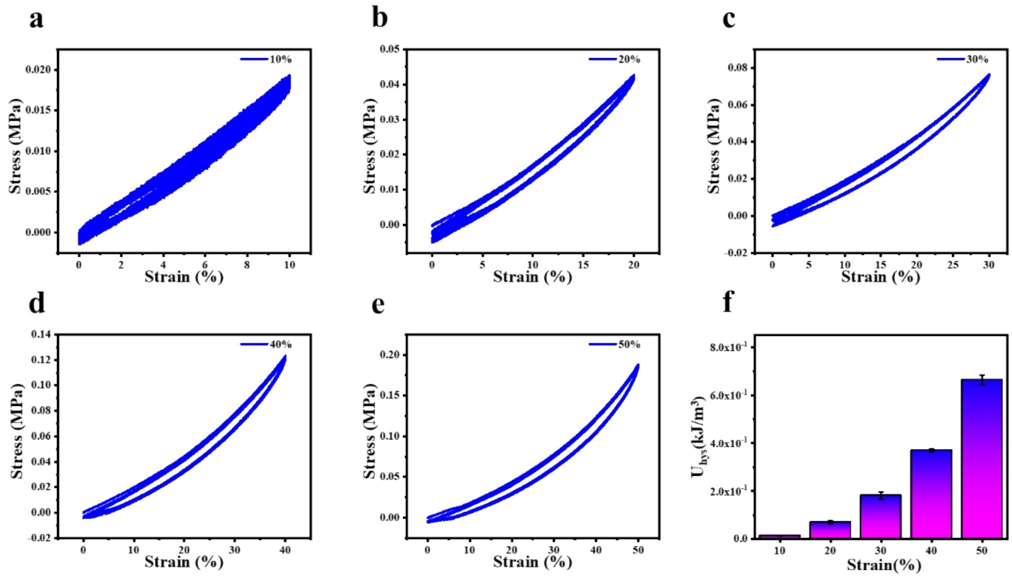

Figure S7. 10-50% cyclic compression stress-strain curves for PU: (a) 10%, (b) 20%, (c) 30%, (d) 40%, (d) 50%, (f) corresponding dissipated energy density at each loading strain.

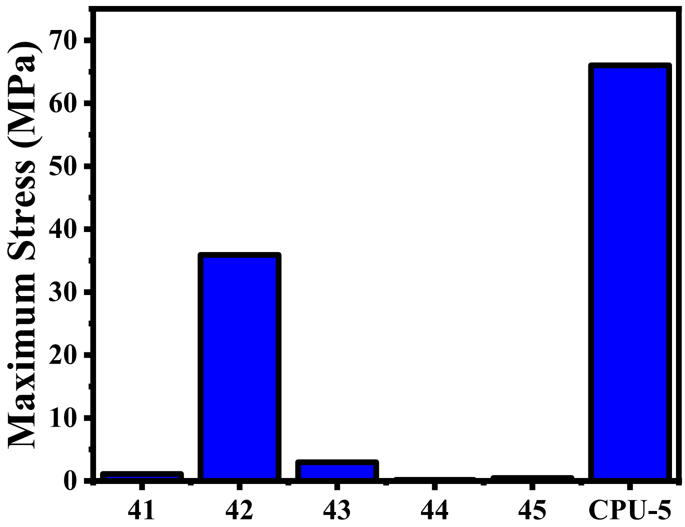

Figure S8. Comparison of mechanical properties of CPU-5 with other ionic conductors.

3. Electrical and Pressure Sensing Performance of CPU

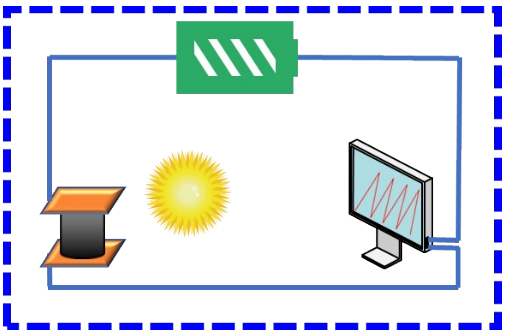

Figure S9. Scheme of the assembled pressure sensor.

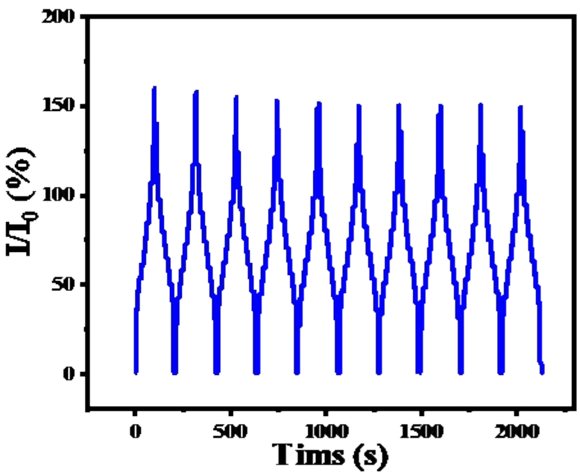

Figure S10. Electrical signal response plots for 10 30% load-unload cycles after 30 days of CPU-5 in air placement.

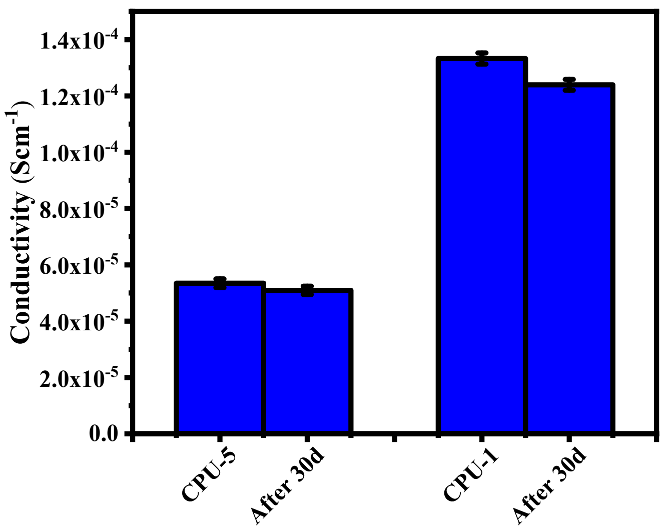

Figure S11. Plot of conductivity comparison between CPU-1 and CPU-5 before and after 30 days at room temperature.

4. Thermal Stability of CPU

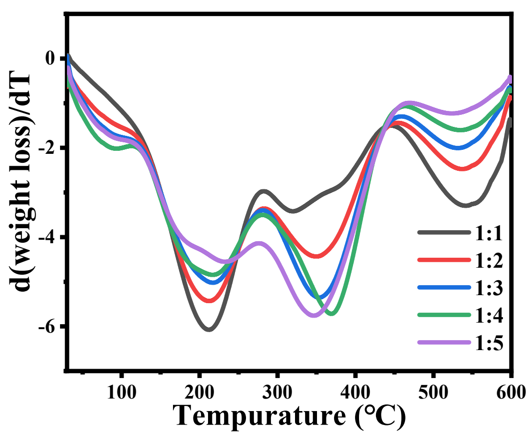

Figure S12. The DTG curves of different CPU samples.

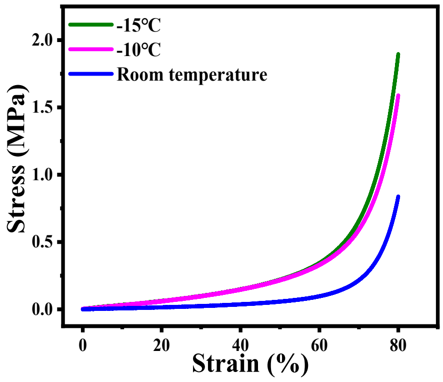

Figure S13. Stress-strain curves of PU subjected to 80% compression at -15°C, -10°C and room temperature.

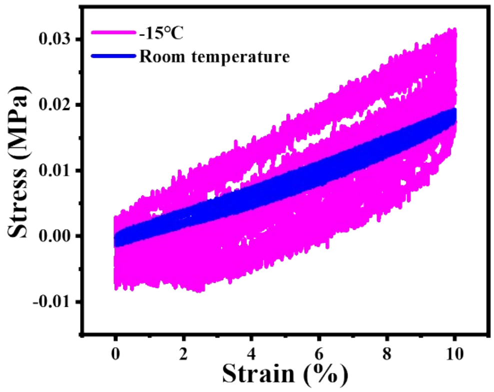

Figure S14. Stress-strain curves of PU subjected to 10 cycles of 10% compression at -15°C and room temperature.

5. Aging Resistance of CPU

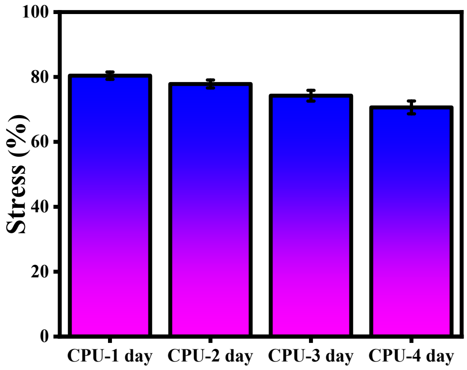

Figure S15. Percentage change in stress at compression to 80% for CPU-5 after UV aging for 1 to 4 days compared to unaged samples.