**Figure S1:** Raman Spectrum obtained for hybrid material SZ4; (a) 3200 cm\(^{-1}\) – 1500 cm\(^{-1}\), (b) 600 cm\(^{-1}\) – 690 cm\(^{-1}\) and (c) 1000 cm\(^{-1}\) – 300 cm\(^{-1}\).
**Figure S2:** Bode plots obtained for increasing concentrations of [P\textsubscript{6,6,6,14}][DCA] and [P\textsubscript{6,6,6,14}][N\textsubscript{f}2] incorporated in SZ4 matrix.
Figure S3: Ionogel Thickness Analysis

Figure S3(a): Ionogel and electrode thickness reproducibility analysis for ionogels containing 60wt% phosphonium IL and 40wt% SZ4.
Figure S3 (b): Ionogel reproducibility analysis for ionogels containing 40wt% phosphonium IL and 60wt% SZ4.
Figure S3 (c): Ionogel thickness reproducibility analysis for ionogels containing 50wt% [emIm][FAP] and 50wt% SZ4.
Figure S3 (d): Ionogel thickness reproducibility analysis for ionogels containing 80wt% [emIm][FAP] and 20wt% SZ4.
Figure S4: Nyquist plots obtained for (a) SZ-4 ionogels containing 60 wt% of [P₆₆₆₁₄][DCA] and (b) [P₆₆₆₁₄][NTf₂].