

**Electronic Supplementary Information**

**Relationships between center atom species (N, P) and ionic conductivity,  
viscosity, density, self-diffusion coefficient of quaternary cation  
room-temperature ionic liquids**

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**Table S1: Densities, Viscosities, Ionic conductivities, Self-diffusion Coefficients, and Molar Conductivities of TEPA-TFSA and TEPP-TFSA at 30 °C**

	$\rho$	$\eta$	$\sigma$	$D_{\text{cation}}$	$D_{\text{anion}}$	$A_{\text{imp}}$	$A_{\text{NMR}}$
TEPA-TFSA	1.306	127.2	1.34	9.09E-12	9.23E-12	0.507	0.677
TEPP-TFSA	1.298	68.2	2.06	1.39E-11	1.5E-11	0.746	1.068

$\rho$  : g cm<sup>-3</sup>

$\eta$  : mPas

$\sigma$  : mScm<sup>-1</sup>

$D_{\text{cation}}, D_{\text{anion}}$  : m<sup>2</sup>s<sup>-1</sup>

$A_{\text{imp}}, A_{\text{NMR}}$  : Scm<sup>2</sup>mol<sup>-1</sup>