Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information for:

Fluorine-Free Salts for Aqueous Lithium-ion and Sodium-ion Battery Electrolytes

Elham Hosseini-Bab-Anari,‡[a] Andrea Boschin,‡[b] Toshihiko Mandai,[b] Hyuma Masu,[c] Kasper Moth-Poulsen[a*] and Patrik Johansson[b*]

[a] Department of Chemistry and Chemical Engineering, Chalmers University of Technology, 412 96 Gothenburg, Sweden. **Email**: kasper.moth-poulsen@chalmers.se

[b] Department of Physics, Chalmers University of Technology, 412 96 Gothenburg, Sweden. **Email**: patrik.johansson@chalmers.se

[c] Center for Analytical Instrumentation, Chiba University, 1-33 Yayoi-cho, Inage-ku, Chiba, 263-8522, Japan

Contents

* To whom correspondence should be addressed

‡ These authors have contributed equally to this paper

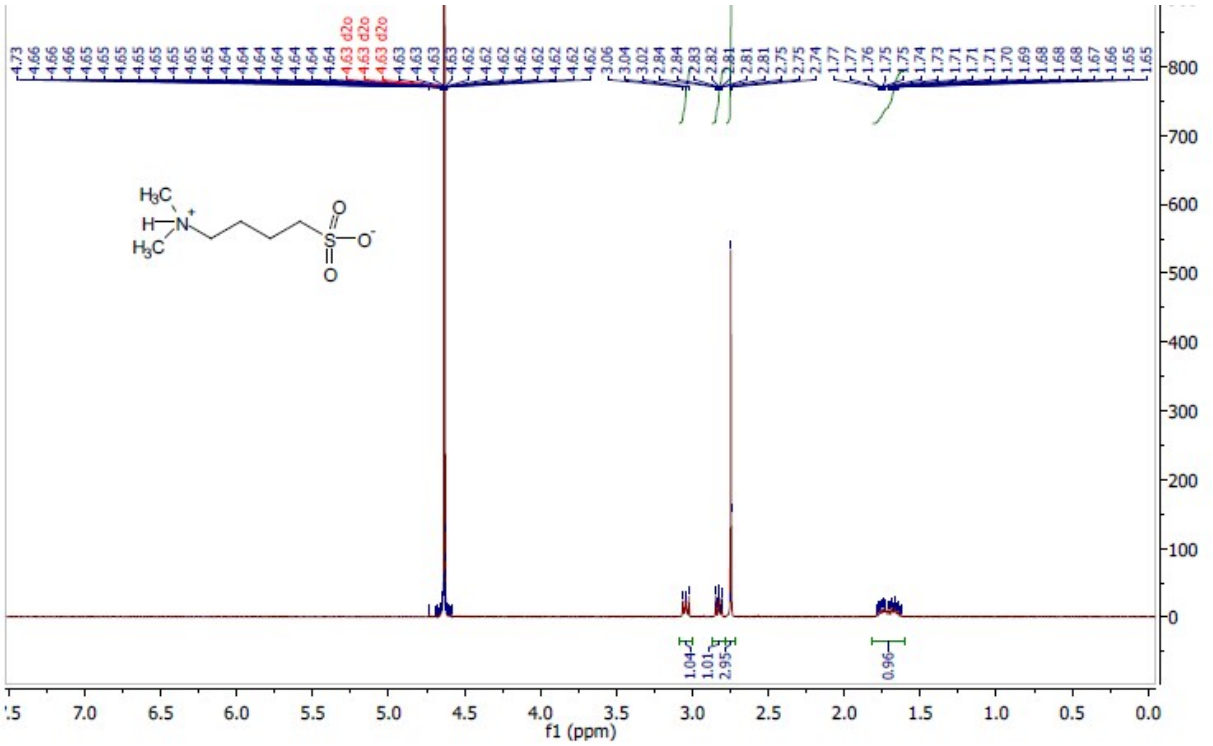


Figure S1: ^{1}H-NMR of ZDMBS

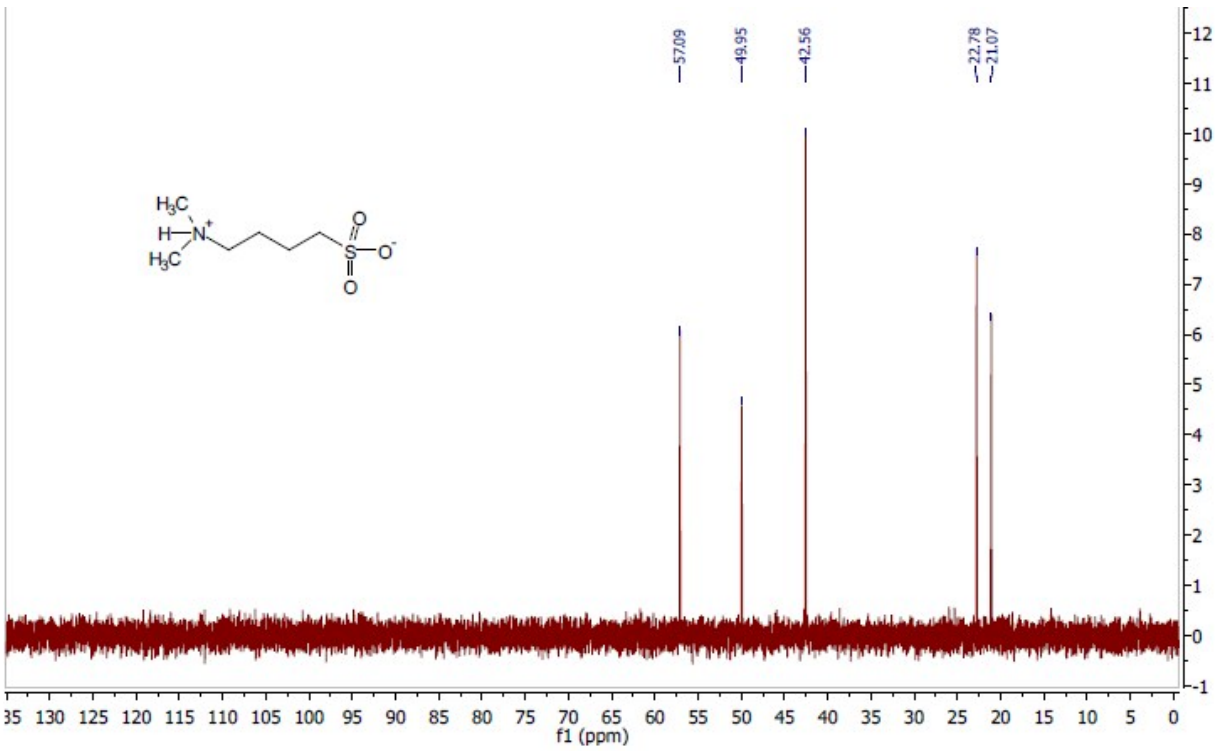


Figure S2: ^{13}C-NMR of ZDMBS

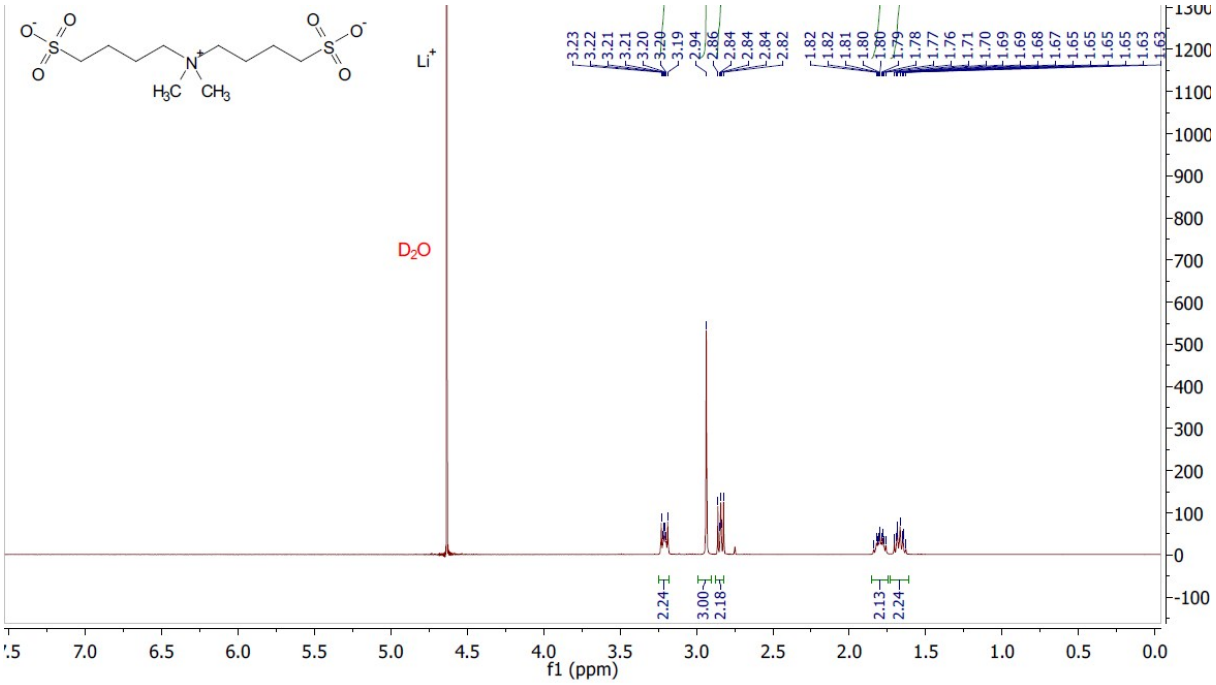


Figure S3: ^{1}H-NMR of LiMM4411

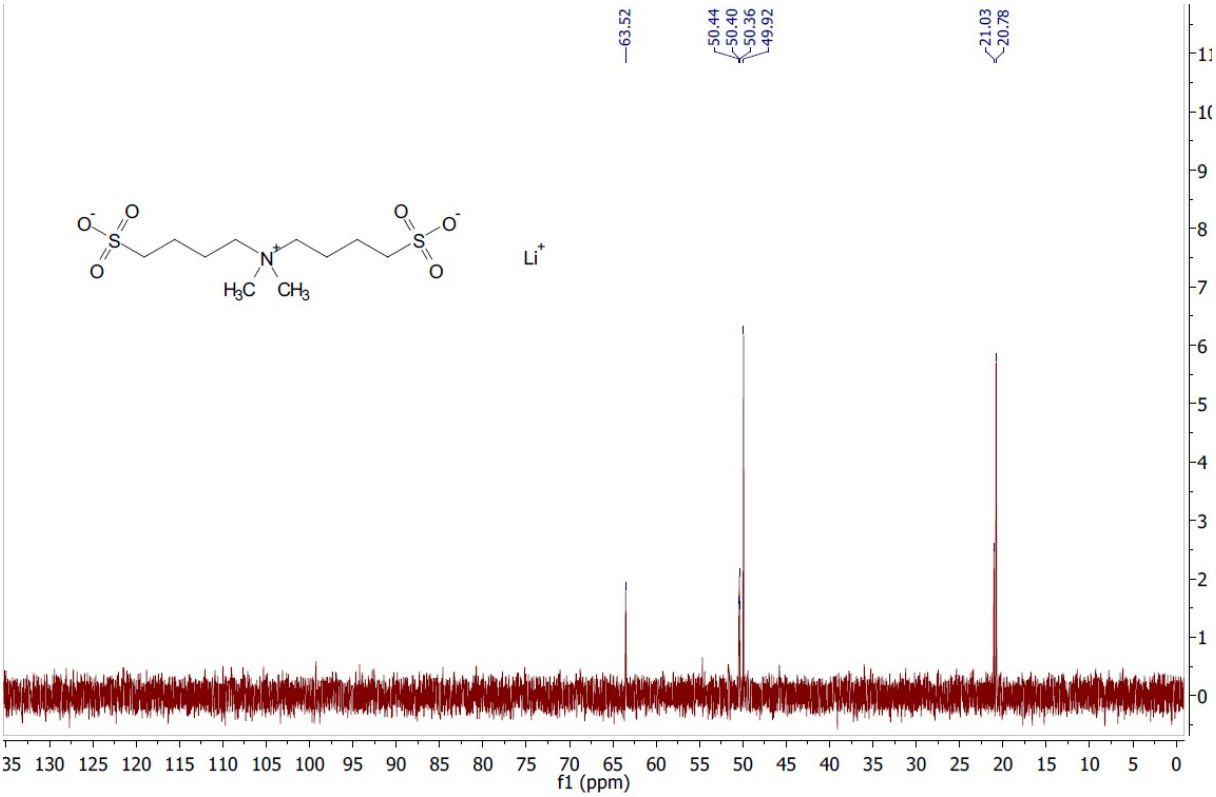


Figure S4: ^{13}C-NMR of LiMM4411

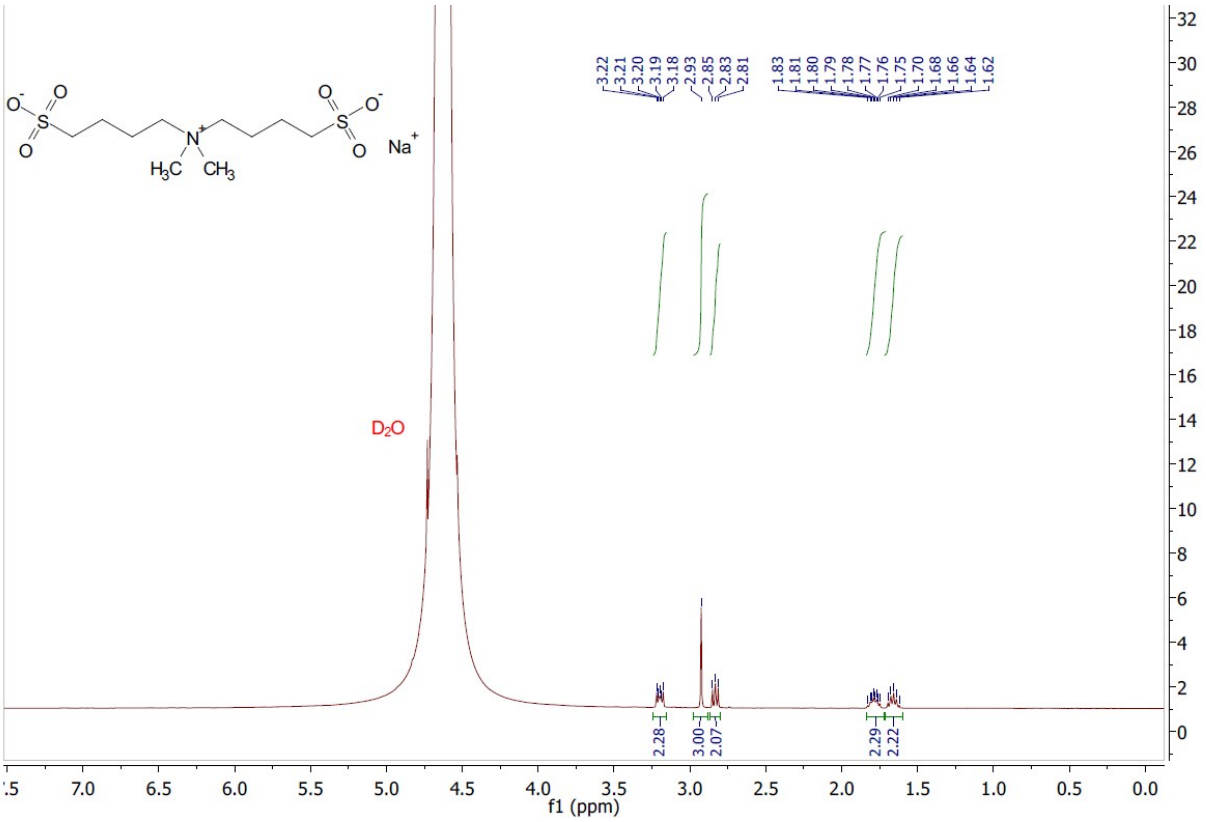


Figure S5: ^{1}H-NMR of NaMM4411

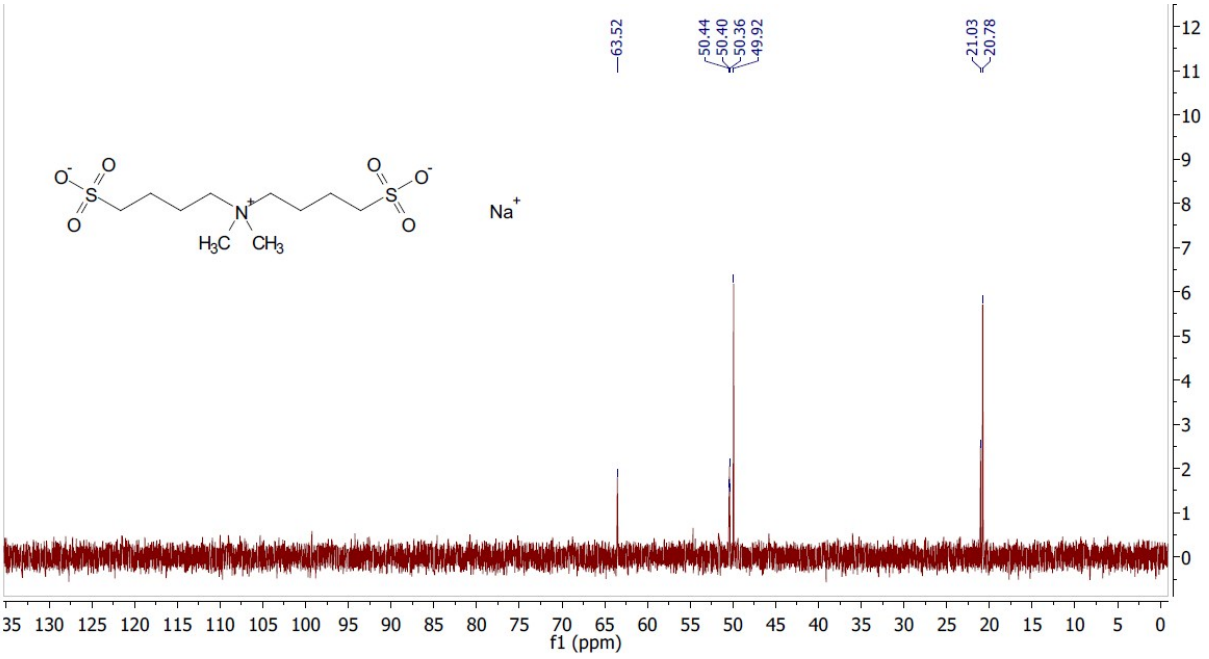


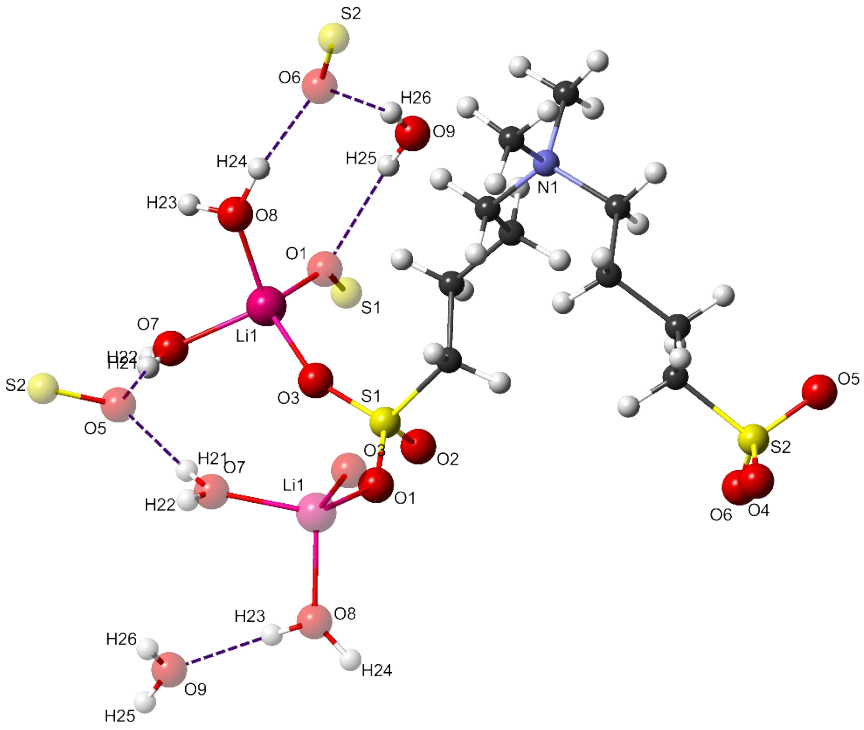
Figure S6: ^{13}C-NMR of NaMM4411

Table S1. Selected dihedral angles in the crystals of LiMM4411 and NaMM4411. Atomic numbering is the same as in Figure 2.

	Dihedral angle / °	
	LiMM4411	NaMM4411
N1–C3–C4–C5	175.80	179.29
C3–C4–C5–C6	−70.29	−175.69
C4–C5–C6–S1	−175.86	177.18
N1–C7–C8–C9	165.08	172.01
C7–C8–C9–C10	−80.06	−73.31
C8–C9–C10–S2	−177.75	−170.68

Table S2. Hydrogen bond (HB) distances in the LiMM4411 crystal. The atomic numbering corresponds to the model illustrated below, where dotted lines indicate HBs.

LiMM4411	HB distance / Å
O7–H21···O5	2.047
O7–H22···O5	1.997
O8–H23···O9	1.959
O8–H24···O6	1.852
O9–H25···O1	2.222
O9–H26···O6	2.176



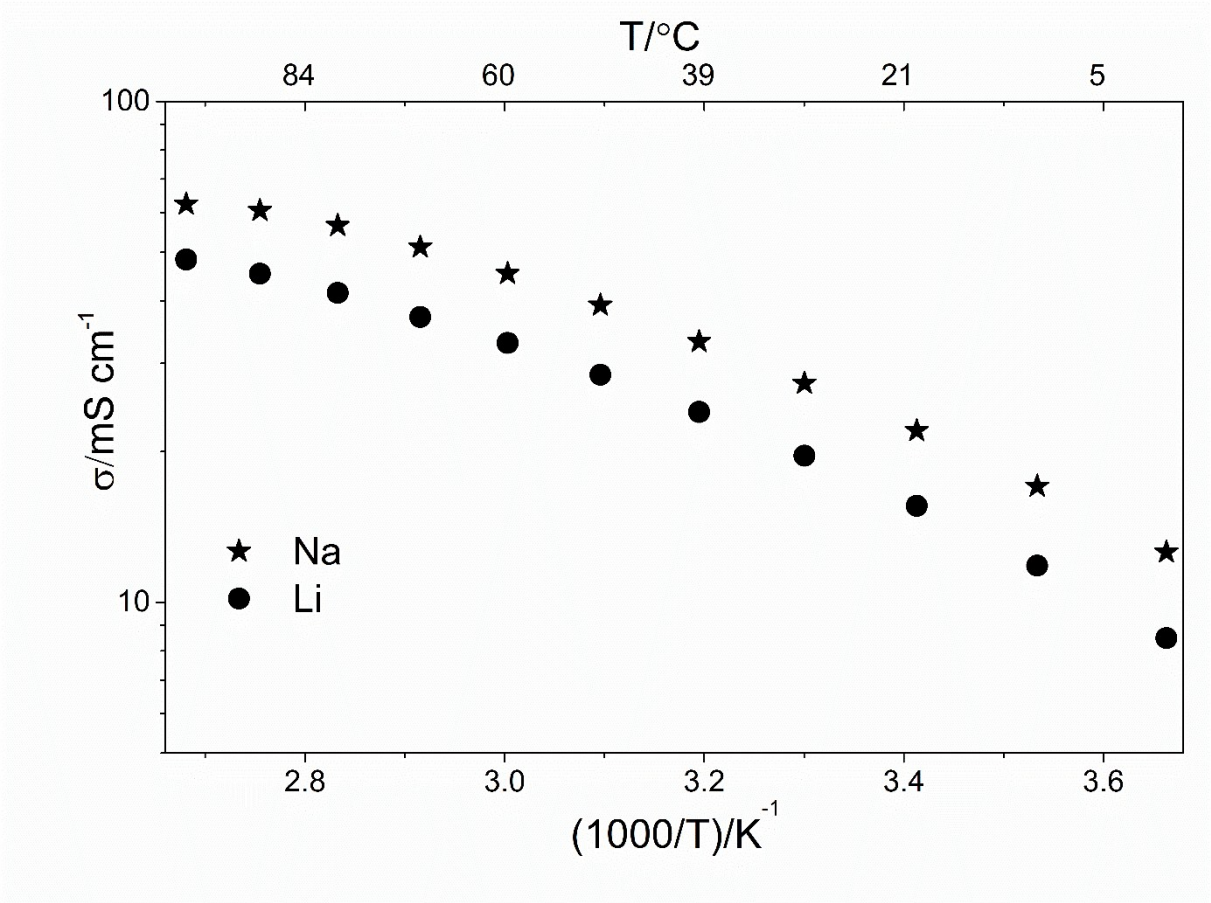


Figure S7: Arrhenius plots of ionic conductivities for heating scans of NaMM4411 and LiMM4411 1.5 m aqueous electrolytes.

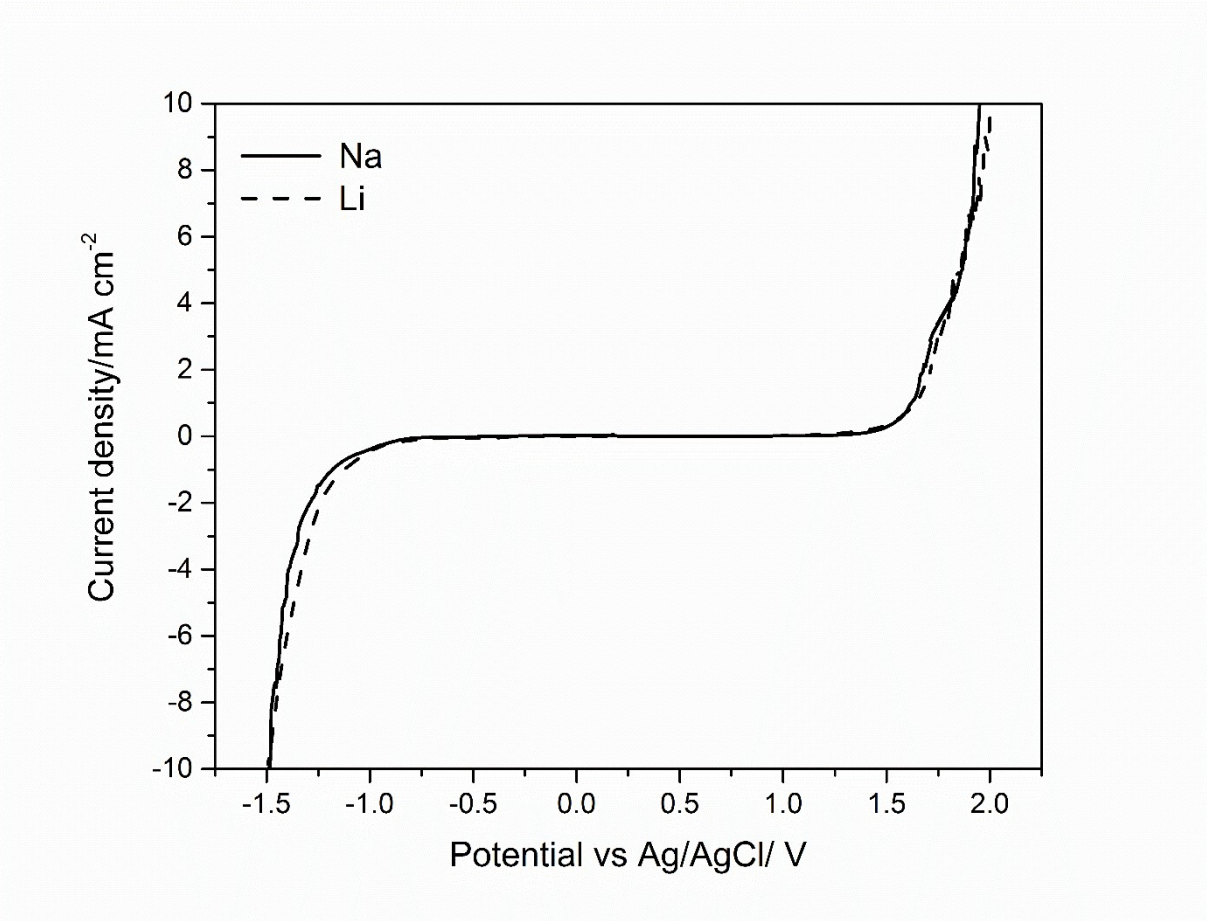


Figure S8: Electrochemical stability window of NaMM4411 and LiMM4411 1.5 m aqueous electrolytes.