

**Novel mixtures of ether-functionalized ionic liquids and non-flammable
methylperfluorobutylether as safe electrolytes for lithium metal battery**

Shaohua Fang ^{a*}, Long Qu ^a, Dong Luo ^a, Shumin Shen ^a, Li Yang ^{a,b*}, Shin-ichi Hirano ^b

^a *School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University, Shanghai
200240, China*

^b *Hirano Institute for Materials Innovation, Shanghai Jiao Tong University, Shanghai 200240,
China*

*** Corresponding authors**

Tel: +86 21 54748917.

Fax: +86 21 54741297.

E-mail: housefang@sjtu.edu.cn (S.H. Fang) or liyangce@sjtu.edu.cn (L. Yang).

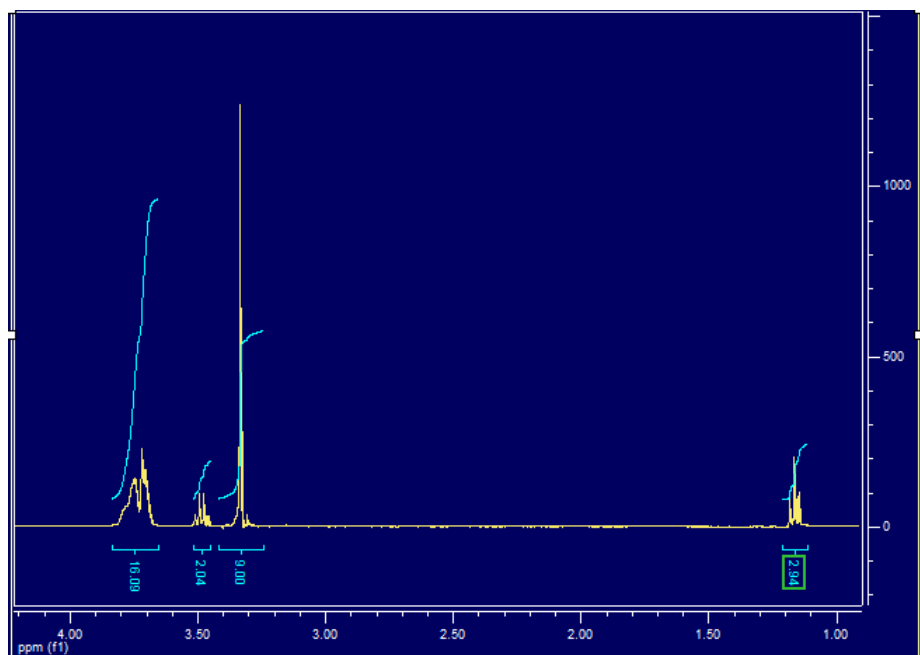


Fig. S1 ¹H NMR spectrum of N(2o1)₃(2o2)TFSI

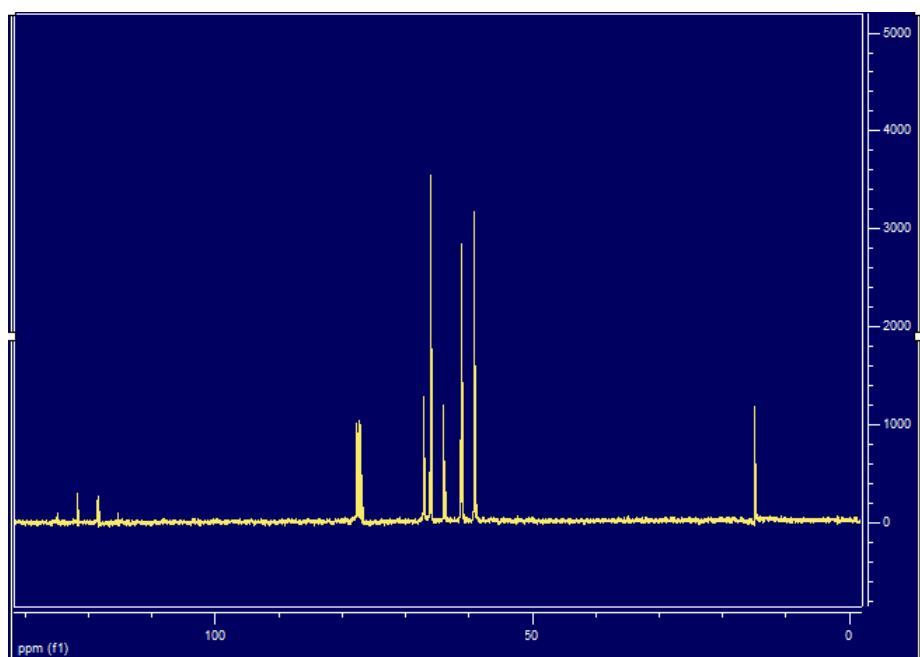


Fig. S2 ¹³C NMR spectrum of N(2o1)₃(2o2)TFSI

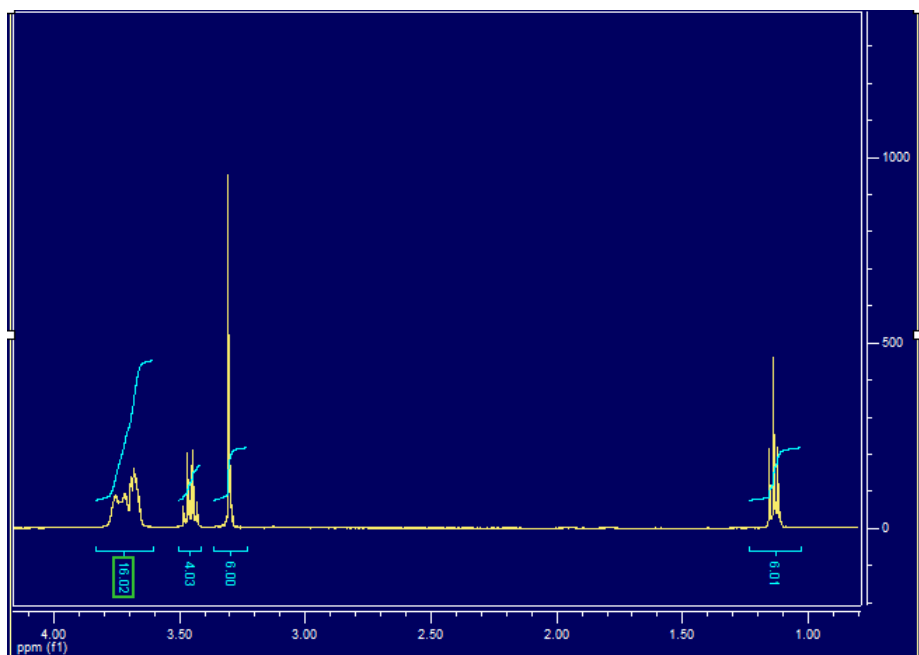


Fig. S3 ¹H NMR spectrum of N(2o1)₂(2o2)₂TFSI

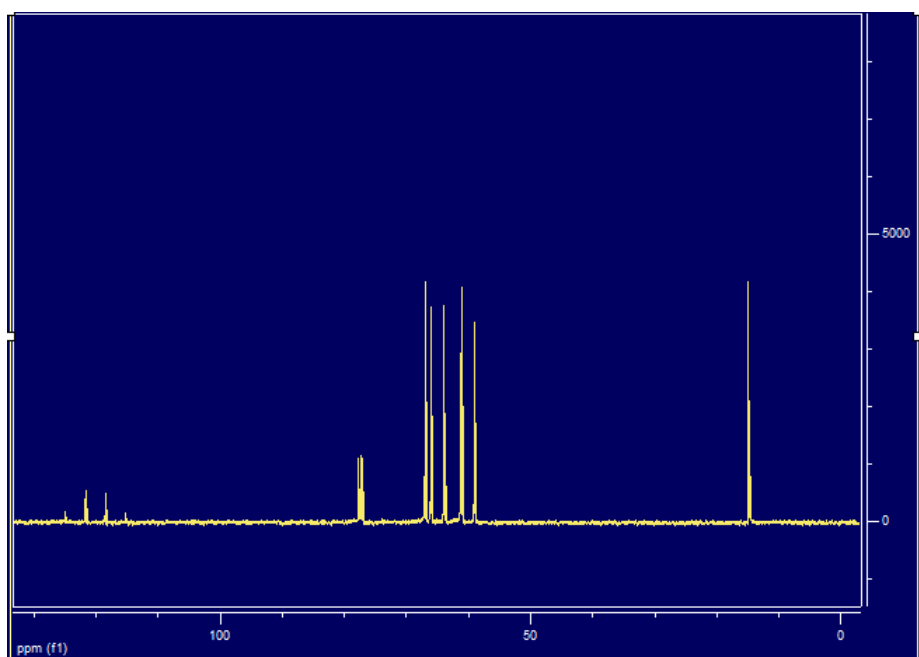


Fig. S4 ¹³C NMR spectrum of N(2o1)₂(2o2)₂TFSI

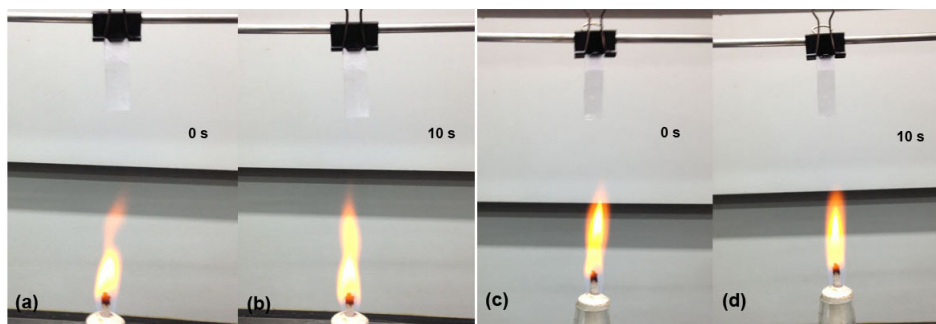


Fig. S5 Pictures of flammability test: (a) and (b) 0.6 M LiTFSI/75 wt% N(2o1)₃(2o2)TFSI+25 wt% MFE, (c) and (d) 0.6 M LiTFSI/65 wt% N(2o1)₂(2o2)₂TFSI+35 wt% MFE.

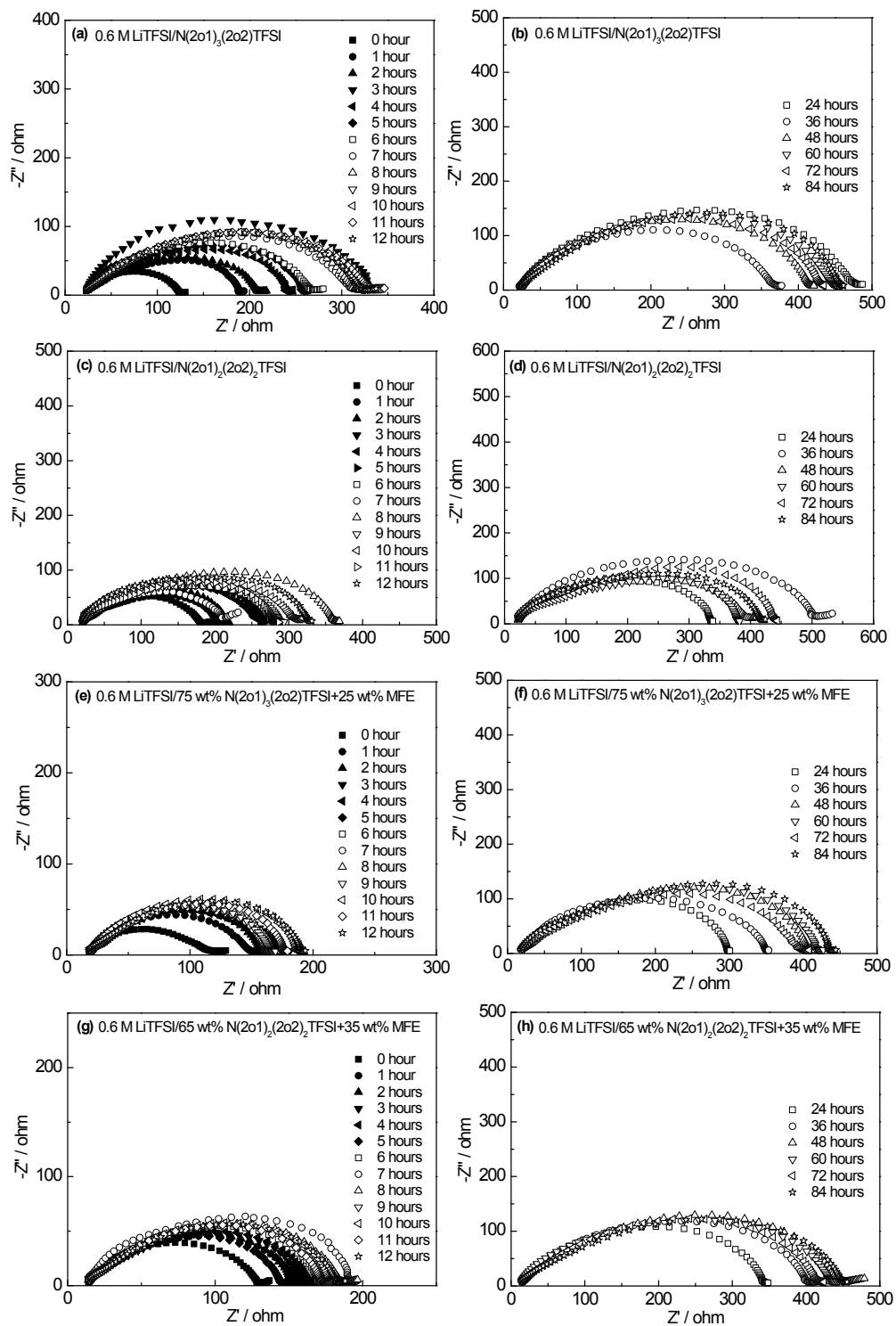


Fig. S6 Time evolution of the impedance response of symmetric lithium cell: (a), (c), (e) and (g) from 0 h to 12 h, (b), (d), (f) and (h) from 24 h to 84 h.