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

Using Siloxane-based Liquid Electrolytes with High Stability for Fluoride Shuttle Batteries

Asuman Celik Kucuk,[*a] Toshiro Yamanaka[a] and Takeshi Abe[b]

Office of Society-Academia Collaboration for Innovation, Kyoto University, Katsura, Nishikyo, Kyoto 615-8530, Japan.
Graduate School of Global Environmental Studies, Kyoto University, Katsura, Nishikyo, Kyoto 615-8510, Japan.

Supporting information

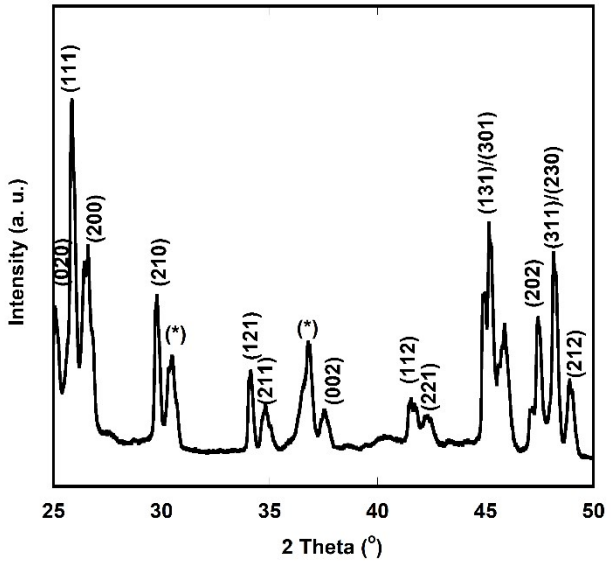

Fig. S1 X-ray diffraction patterns of BiF_3/C in the pristine state; * represents the peak related to the pocket.

a)

b)

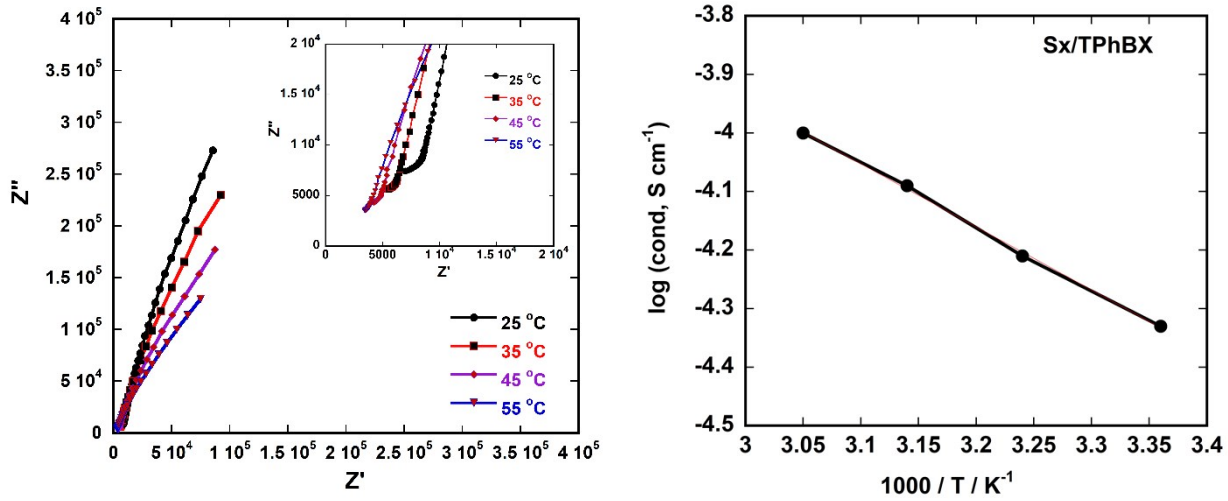

Fig. S2 (a) Temperature dependence of the ionic conductivity for the Sx/TPhBX electrolyte solution (b) Temperature dependence of the conductivity of Sx/TPhBX prepared using Sx; 2,2,4,4-Tetramethyl-3,8,11,14,17-pentaoxa-2,4-disilaoctadecane and TPhBX; 2,4,6-triphenylboroxin, with saturated CsF.

Table S1 Comparison between the temperature dependence of the conductivity of the Sx/TPhBX and Sx solutions (TPhBX; triphenyl boroxine, Sx; 2,2,4,4-tetramethyl-3,8,11,14,17-pentaoxa-2,4-disilaoctadecane, Ea; Activation Energy)

	25˚C	**35˚C**	**45˚C**	**55˚C**	**Ea (kj/mol)**
Sx/TPhBX	4.62 x 10^{-5}	6.24 x 10^{-5}	8.06 x 10^{-5}	9.96 x 10^{-5}	20.61

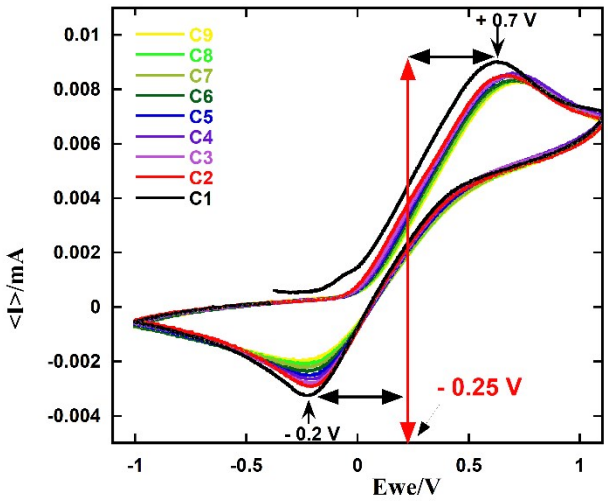

Fig. S3 Determination of the redox potential of Ag^{+}/Ag in the Sx/TPhBX electrolyte against SHE by adding 0.004 M ferrocene to Sx/TPhBX. The anodic (Epa) and cathodic (Epc) peak potentials were obtained at a scan rate of 5 mV s^{-1}. The halfwave potential ($E_{1/2}$) of the $Fe(C_2H_5)_2^{+}/Fe(C_2H_5)_2$ (Fc^{+}/Fc) couple in the Sx/TPhBX electrolyte was found to be 0.25 V.

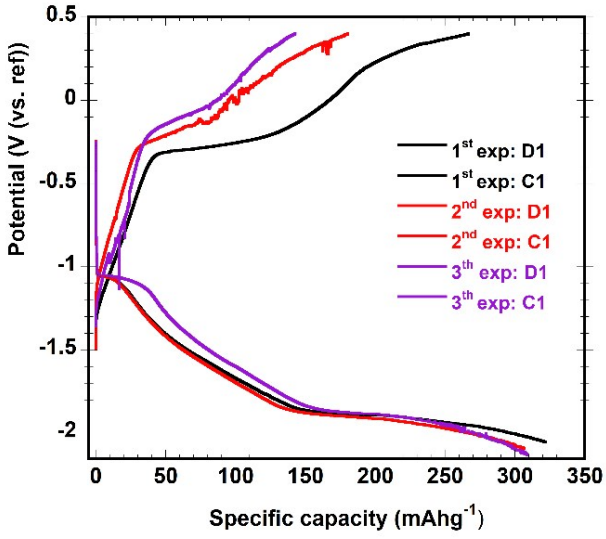

Fig. S4 The potential profile of the BiF_3/C nanocomposite electrode in Sx/TPhBX was investigated three times (1^{st} exp: 1^{st} experiment, 2^{nd} exp: 2^{nd} experiment, 3^{th} exp: 3^{th} experiment).

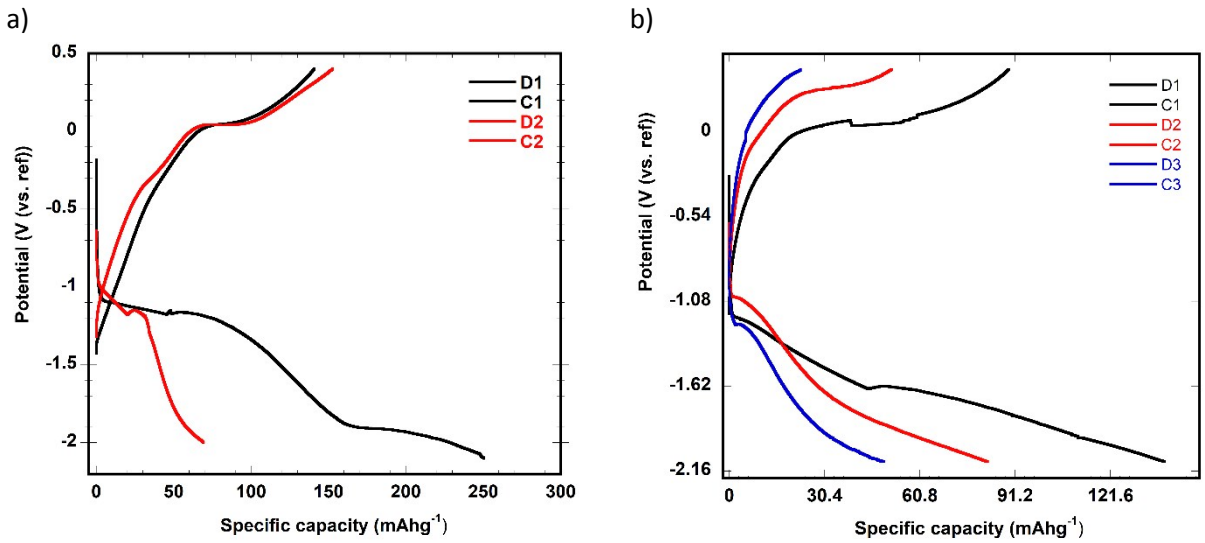

Fig. S5 Initial two or three discharge–charge curves of BiF_3/C nanocomposite electrodes cycled at room temperature and at (a) C/20, and (b) C/10 rates in Sx/TPhBX (discharging cutoff voltage: –2.05 V; charging cutoff voltage: 0.4 V).