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Protic ionic liquid and ionic melts prepared from methanesulfonic acid and 1*H*-1,2,4-triazole as high temperature PEMFC electrolytes

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Table S1 Torsion angles (°) for **1**

N(1)–N(2)–C(2)–N(3)	0.04(19)
N(2)–N(1)–C(3)–N(3)	0.73(19)
C(2)–N(3)–C(3)–N(1)	-0.67(19)
C(3)–N(1)–N(2)–C(2)	-0.47(19)
C(3)–N(3)–C(2)–N(2)	0.4(2)

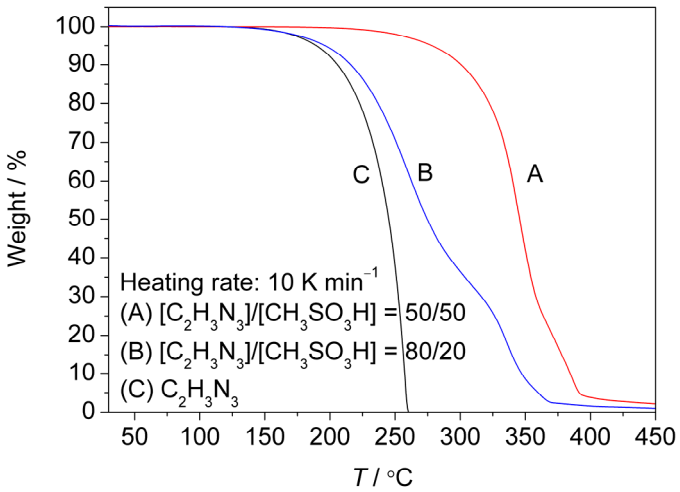

Fig. S1 TG curves of $C_2H_3N_3$ (A), $[C_2H_3N_3]/[CH_3SO_3H]$ = 80/20 (B) and $[C_2H_3N_3]/[CH_3SO_3H]$ = 50/50 (C), heated at 10 K min^{-1} with covered Al_2O_3 pans in a stream of O_2 (60 mL min^{-1}), indicating that the compositions were stable even in O_2 atmosphere. Each sample weight was controlled to be between 12 and 15 mg.

Table S2 Density for the liquid compositions in the acid-rich region, measured at 20.0 °C using Anton Paar DMA 4500 density meter based on the "oscillating U-tube principle".

$[C_2H_3N_3]/[CH_3SO_3H]$	0/100	5/95	10/90	15/85	20/80	25/75	30/70
Density / g mL^{-1}	1.481	1.484	1.488	1.490	1.492	1.493	1.492

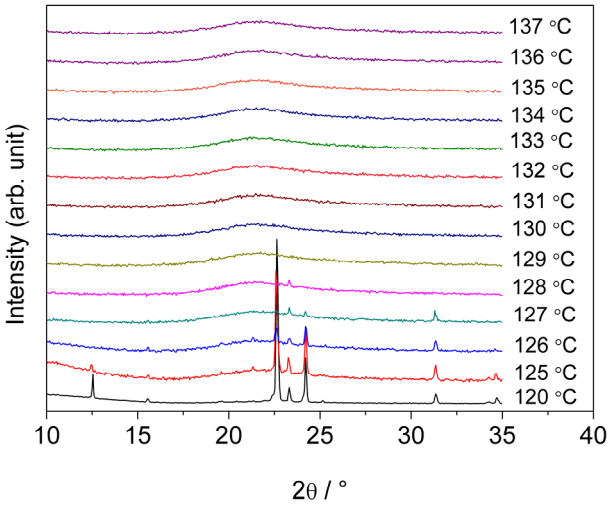

Fig. S2 X-ray thermodiffraction patterns of **1** in argon atmosphere, showing that the crystallinity of **1** was lost at around 129 °C. The heating rate was 5 K min^{-1}. Each temperature was stabilized for 20 min.