Supporting information

High performance supercapacitor under extremely low environmental temperature

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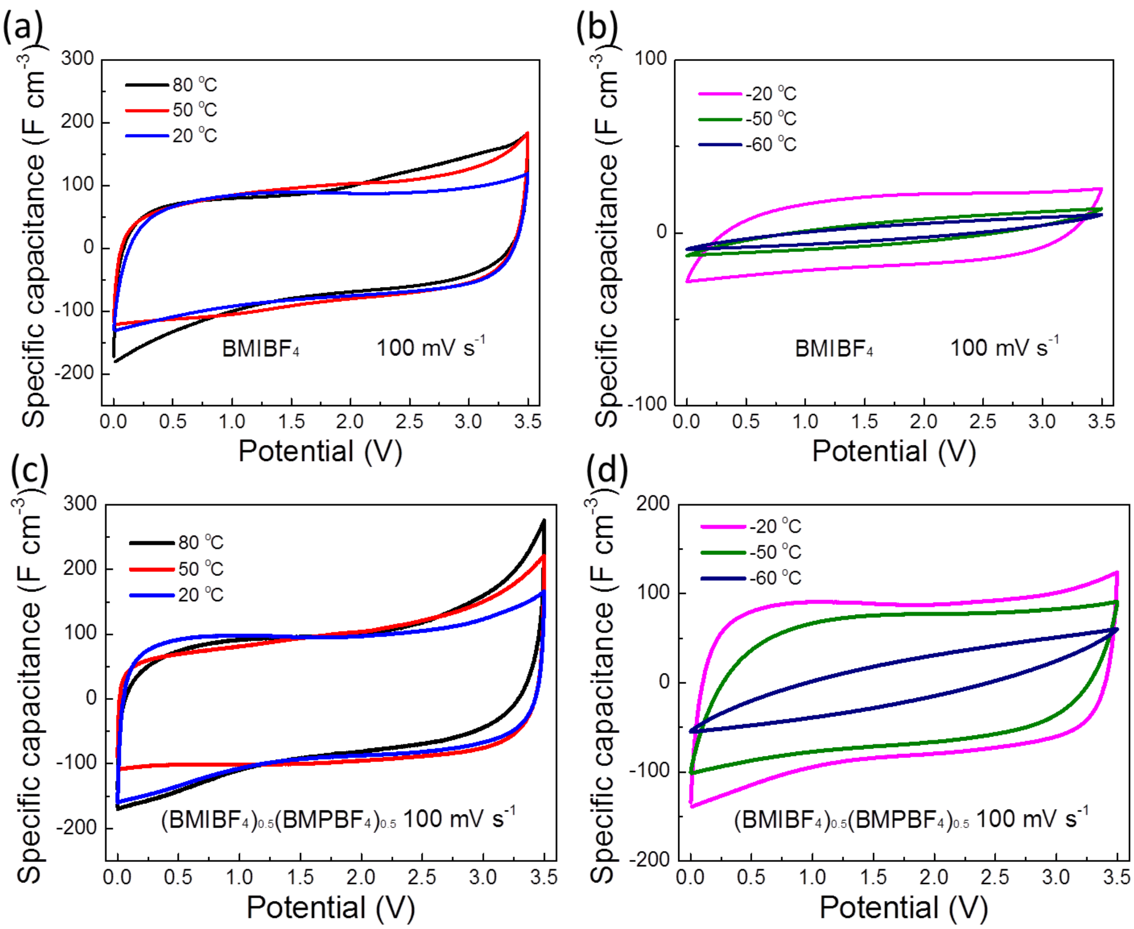

Figure S1. CV curves for the cells with $BMIBF_4$ as the electrolyte with the scan rates of 100 mV s^{-1} at (a) above and (b) below 0 ^{o}C. CV curves for the cells with $(BMIBF_4)_{0.5}(BMPBF_4)_{0.5}$ as the electrolyte at scan rates of 100 mV s^{-1} at (c) above and (d) below 0 ^{o}C

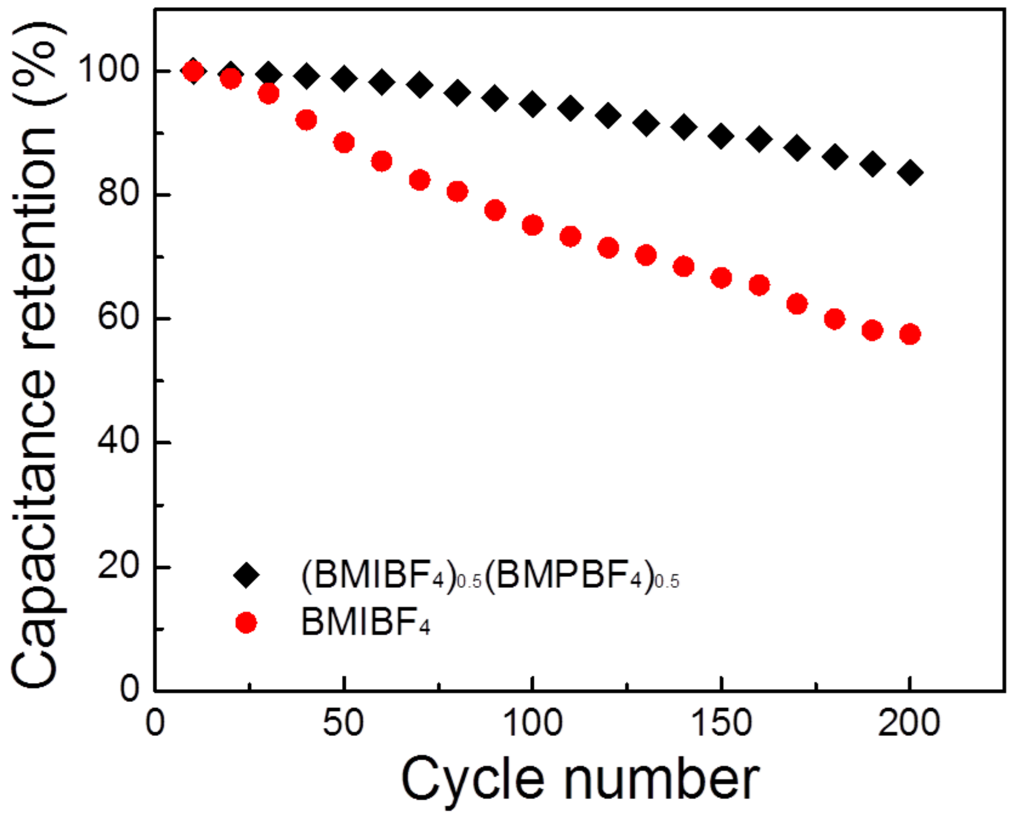

Figure S2. Cyclic stability of the supercapacitor cells under a voltage of 3.5 V at -60 ^{o}C with a scan rate of 5 mV s^{-1} in the two electrolytes.

As shown in Figure S2, the cell with the new eutectic electrolyte can maintain the retention of 84% after 200 cycles. As a comparison, the retention of cell with BMIBF4 is only 57%. The better retention performance of the former cell is attributed to the relatively higher conductivity at -60 ^{o}C. Although the cycle number is not large, it could be deduced that the cell with eutectic electrolyte can maintain long cycle life at other low temperature because the cell with pure ILs has 94% retention shown in Figure S3 after 5000 cycles at room temperature as we did before in our lab (Adv. Mater., 2013, 25,4879).

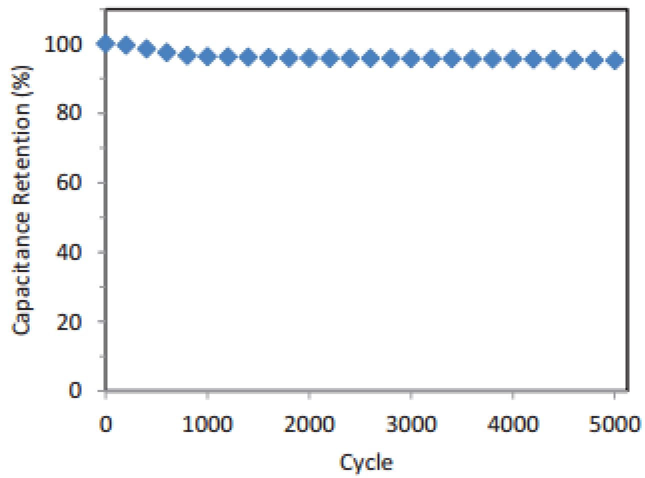

Figure S3. Cyclic stability of the supercapacitor cells under a voltage of 3.5 V at room temperature with $BMIBF_4$ as electrolyte.

The specific capacitance of electrode can be expressed as

$$C = 4 \times \frac{\int I_{discharge} dV}{V \times m \times S}$$

where $I_{discharge}$ is the current of discharge part of CV curve, V is the applied potential, m is the total weight of the two electrodes and S is the scan rate.