Electronic Supplementary Information

Enantiomeric perovskite with dual phase transition at high temperature

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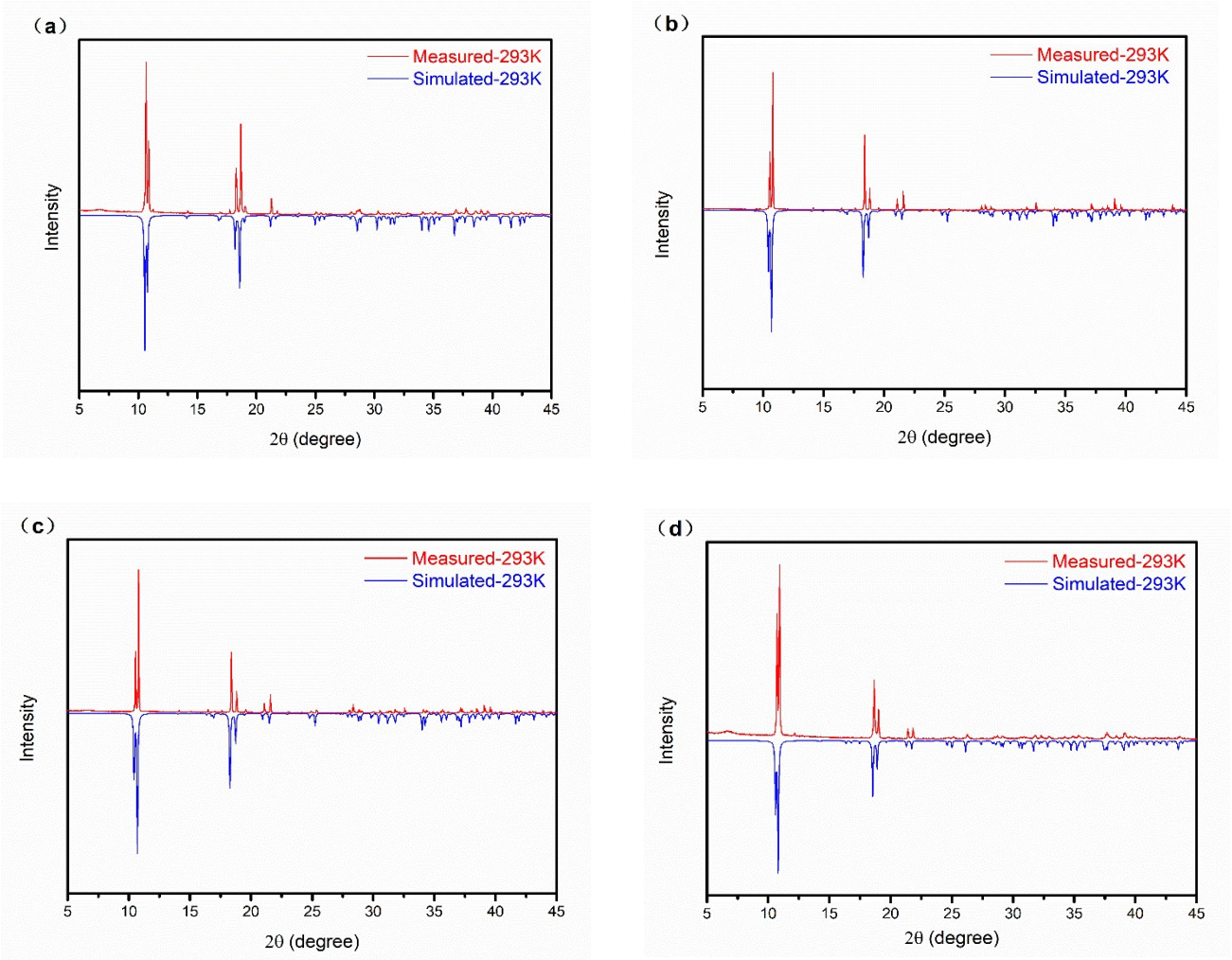

Fig. S1 Measured and simulated powder X-ray diffraction patterns of (a) (N, N-dimethyl pyrrolidinium) $CdCl_3$, (b) (*R*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$, (c) (*S*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ and (d) (*rac*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ at 293 K.

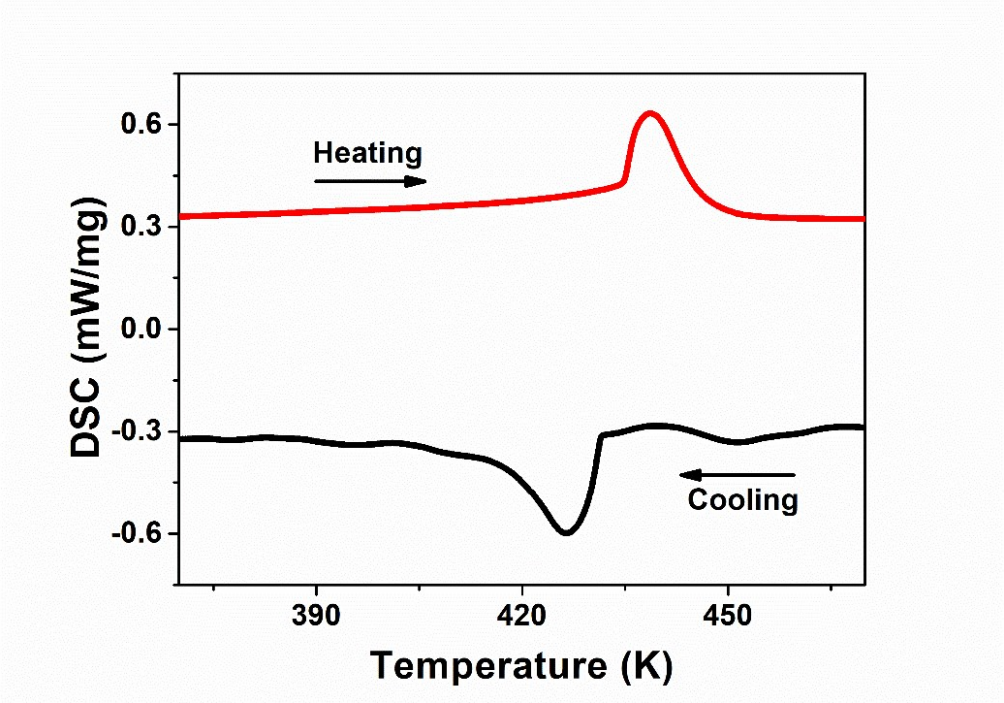

Fig. S2 DSC curves acquired in a heating-cooling cycle of (*rac*) - (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$.

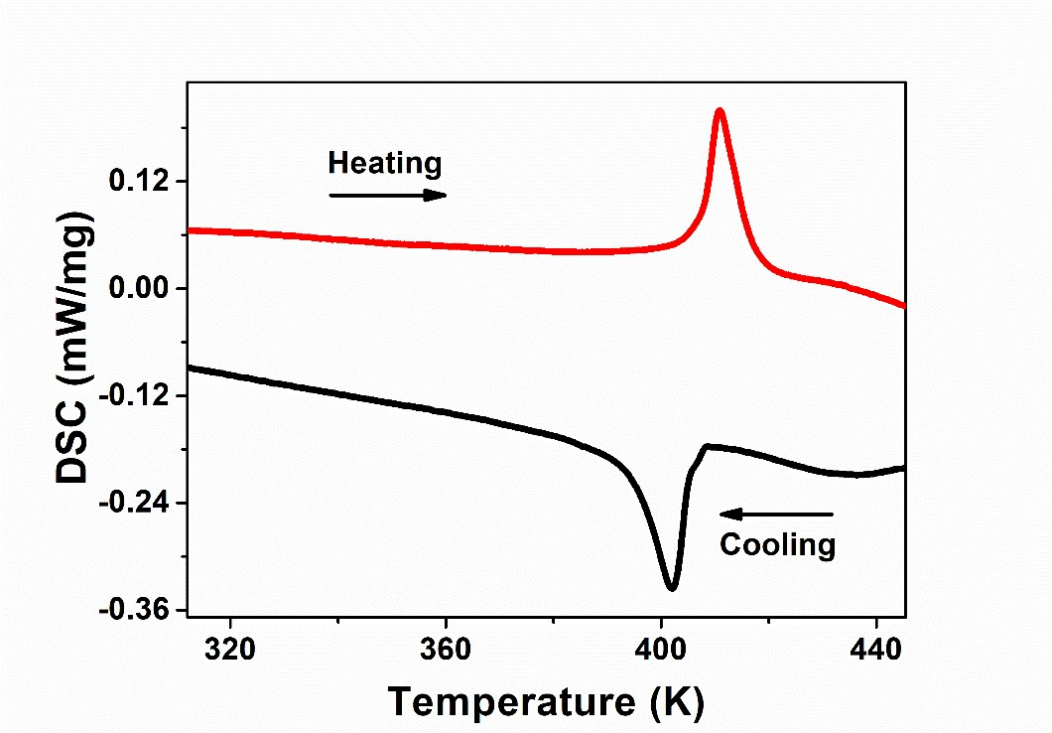

Fig. S3 DSC curves acquired in a heating-cooling cycle of (N, N-dimethyl pyrrolidinium) $CdCl_3$.

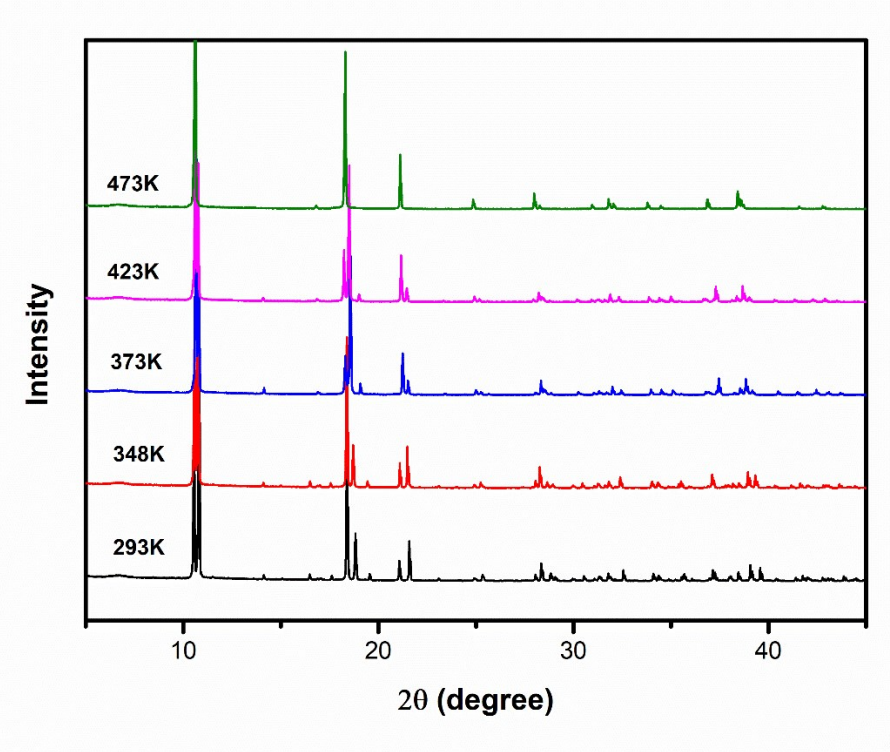

Fig. S4 Variable-temperature PXRD pattern of (*S*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ obtained in the temperature range 293-473 K.

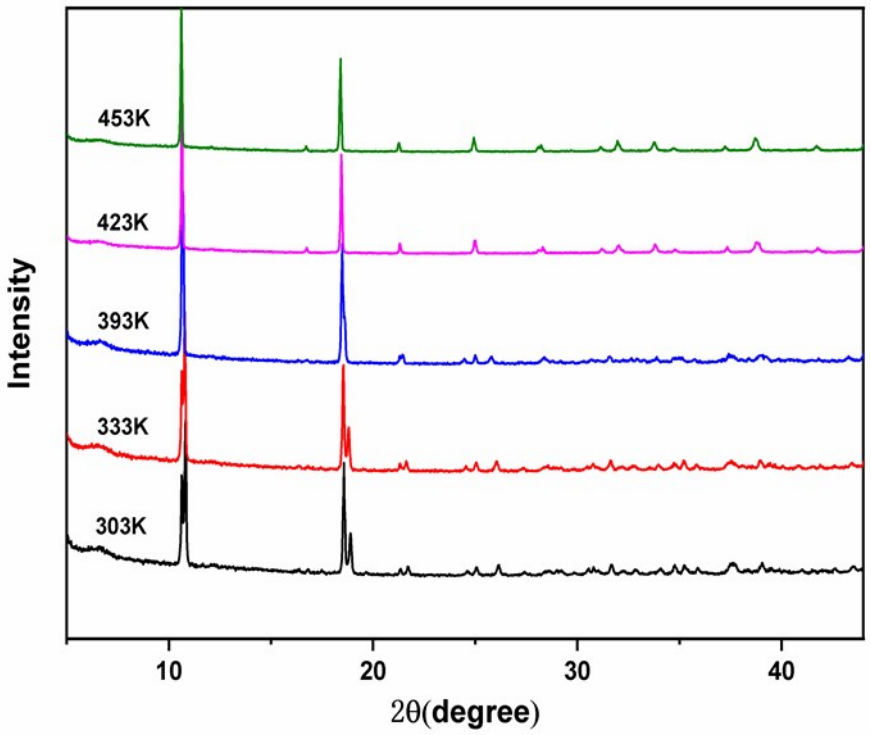

Fig. S5 Variable-temperature PXRD pattern of (*rac*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ obtained in the temperature range 303-453 K.

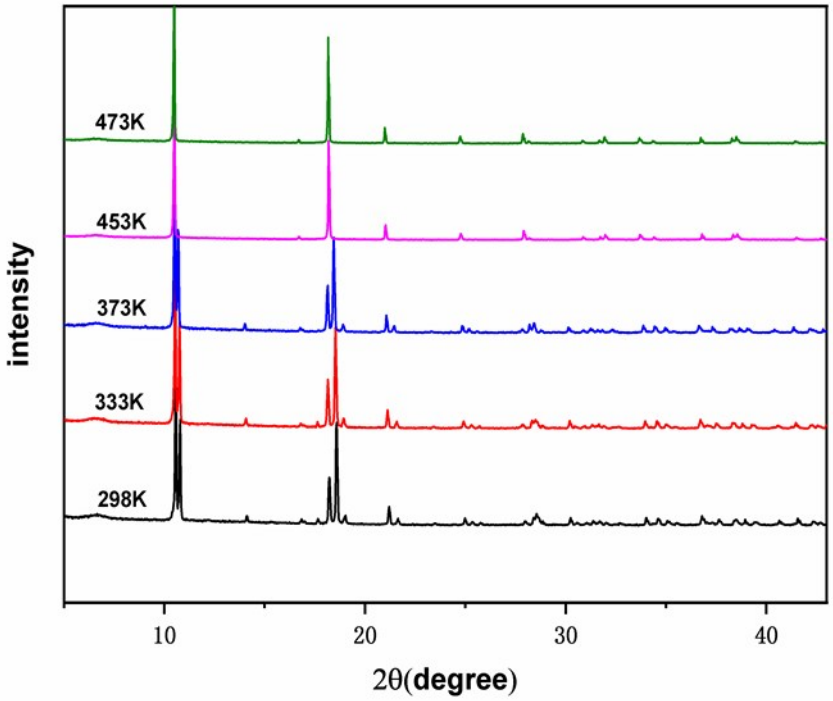

Fig. S6 Variable-temperature PXRD pattern of (N, N-dimethyl pyrrolidinium) $CdCl_3$ obtained in the temperature range 298-473 K.

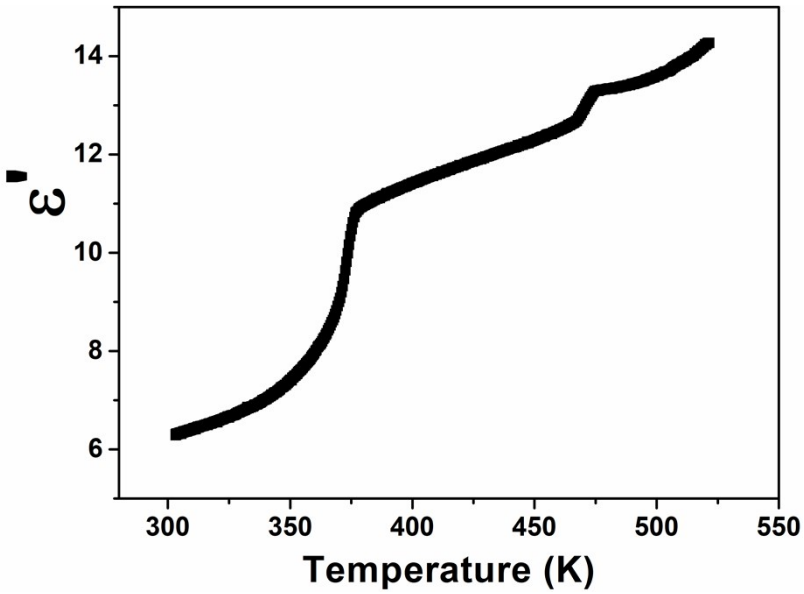

Fig. S7 Temperature dependence of the real part (ε') of the dielectric constant of (*S*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ at 1 MHz in the heating-cooling cycle.

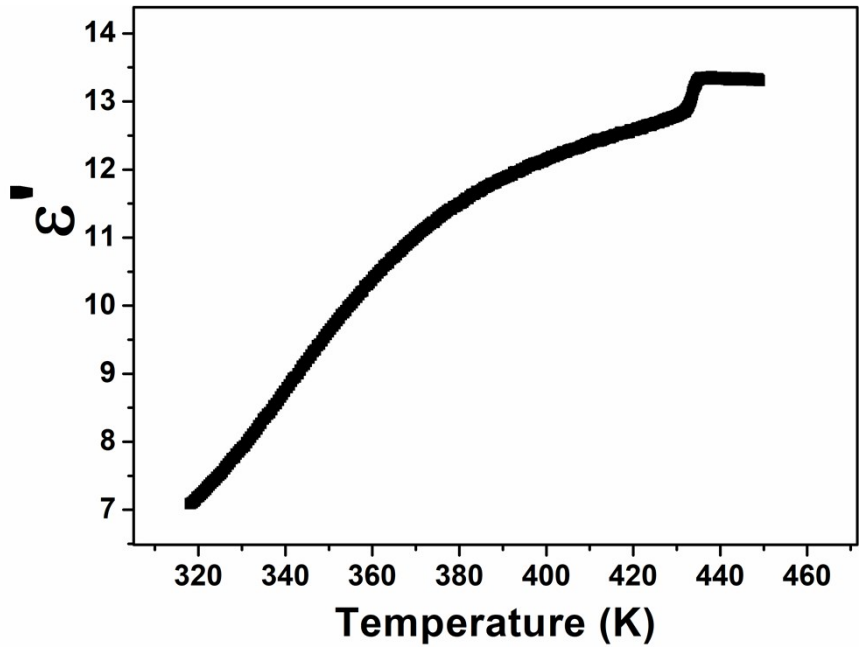

Fig. S8 Temperature dependence of the real part (ε') of the dielectric constant of (*rac*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ at 1 MHz in the heating-cooling cycle.

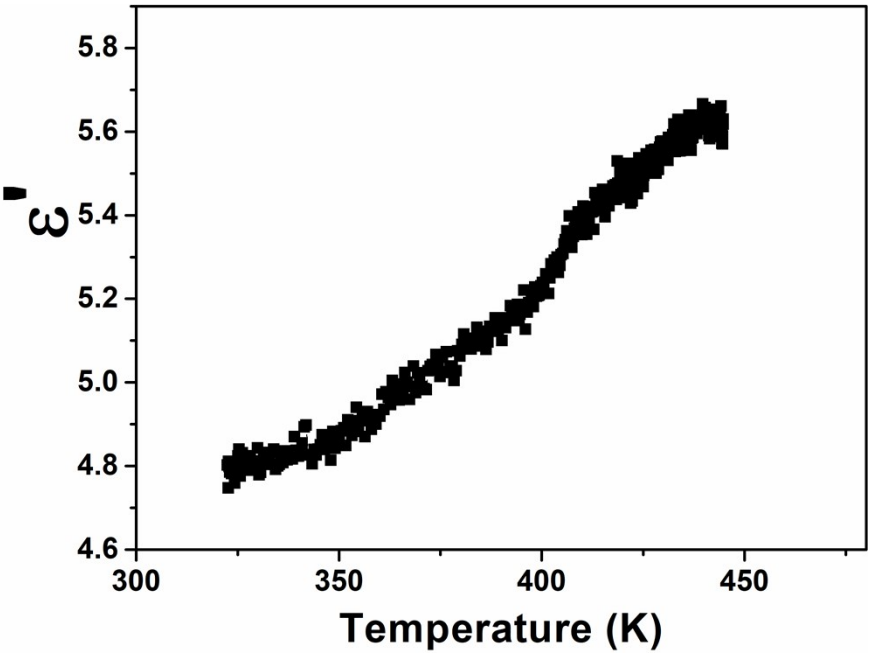

Fig. S9 Temperature dependence of the real part (ε') of the dielectric constant of (N, N-dimethyl pyrrolidinium) $CdCl_3$ at 1 MHz in the heating-cooling cycle.

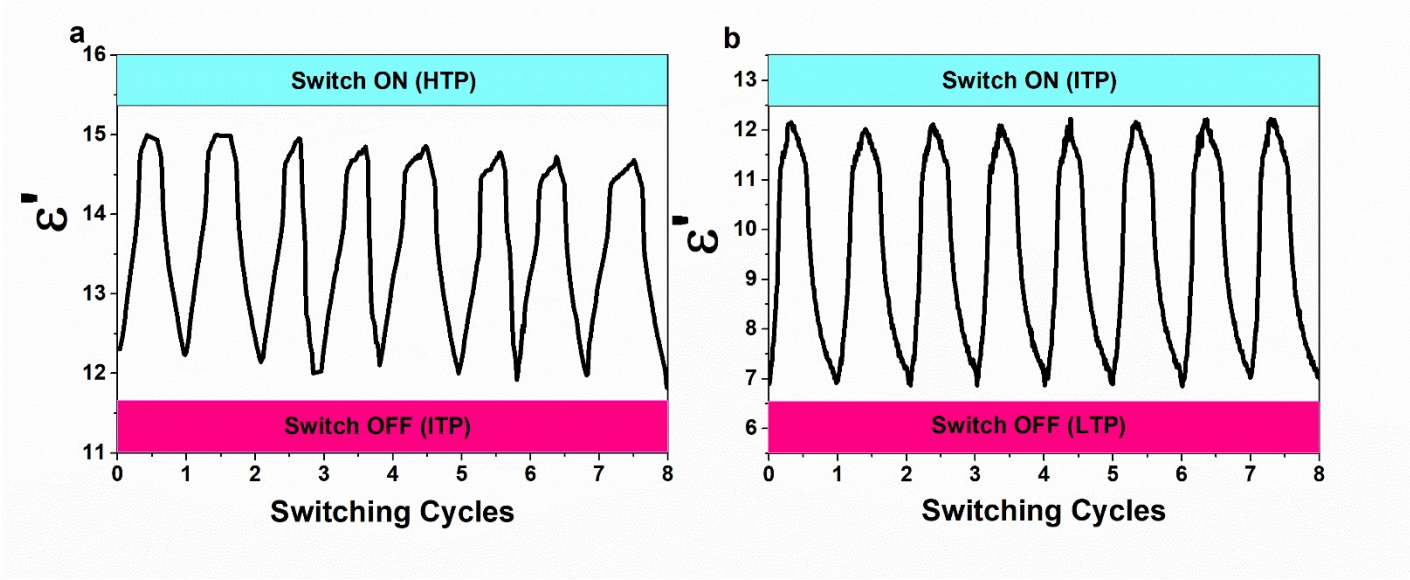

Fig. S10 The switching of the dielectric measurement for the (*S*)- DMFP $CdCl_3$. Switching (a) between HTP and ITP (b) between ITP and LTP.

Table. S1 Crystal data and structure refinements for (*R*)- and (*S*)- (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ at 293K.

Compound	(*R*)-(N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$	(*S*)-(N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$
Temperature	293 K	293 K
Formula	$[C_{12}H_{26}F_2N_2][Cd_2Cl_6]$	$[C_{12}H_{26}F_2N_2][Cd_2Cl_6]$
Formula weight	673.87	673.87
Crystal system	Orthorhombic	Orthorhombic
Space group	$P2_12_12_1$	$P2_12_12_1$
a, *b*, *c* (Å)	6.7569(2)	6.7593(3)
	16.9429(4)	16.9501(6)
	18.9468(5)	18.9218(8)
α, β, γ (°)	90	90
	90	90
	90	90
Volume /Å^3	2169.06(10)	2167.89(15)
Z	4	4
Density/g cm^{-3}	2.064	2.065
R_1	0.0233	0.0156
wR_2	0.0596	0.0396
GOF	1.138	1.046

Table. S2 Crystal data and structure refinements for (*rac*) - (N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$ and (N, N-dimethyl pyrrolidinium) $CdCl_3$ at 293K.

Compound	(*rac*)-(N, N-dimethyl-3-fluoropyrrolidinium) $CdCl_3$	(N, N-dimethyl pyrrolidinium) CdCl3
Temperature	293 K	293 K
Formula	$[C_6H_{13}FN][\ CdCl_3]$	$[C_6H_{14}N][\ CdCl_3]$
Formula weight	336.93	318.95
Crystal system	Orthorhombic	Monoclinic
Space group	*Pbca*	$P2_1/C$
a, *b*, *c* (Å)	16.4212(12)	9.4120(4)
	6.7765(4)	16.6860(7)
	19.4918(15)	6.8357(2)
α, β, γ (°)	90	90
	90	94.382(4)
	90	90
Volume /Å^3	2169.0(3)	1070.40(7)
Z	8	4
Density/g cm^{-3}	2.064	1.980
R_1	0.0709	0.0311
wR_2	0.2144	0.0930
GOF	1.077	1.091