Electronic Supplementary Material (ESI) for Polymer Chemistry.

Supporting Information

for

Terbium based (poly)ionic liquids for anti-counterfeiting and droplet manipulation

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1. **Experimental sections**

Instrumentation. Carbon-13 nuclear magnetic resonance (^{13}C NMR) spectroscopy is performed on a Bruker AVANCE III TM HD 400 MHz at 298 K in DMSO-*d*6 with tetramethylsilane(TMS) as interior standard. The gel permeation chromatography (GPC) measurements of the samples are performed on a Waters GPC equipped with a 1515 HPLC pump, a 2414 RI detector, and three Agilent mixed columns (Agilent, PLgel 10 μm, MIXED-B, Agilent, PLgel 5 μm, MIXED-C). The eluent is N,N-dimethylformamide (DMF) with 0.01M LiBr, and the flow rate is 1.0 mL/min. **Narrow dispersed polystyrenes are used as standard.** The zero field cooling–field cooling (ZFC-FC) curve is performed under applied magnetic fields of 100 Oe, and the testing temperature range is 5-50 k. The contact angle testing is performed on contact angle measuring instrument-POWEREACH JC 2000D under external magnet. And the concentration of the solution is 1 mol/L. **Differential scanning calorimetry (DSC) is performed on a TA Q2000 at a heating rate of 10 ℃/min. And the testing temperature range is -80-180℃.**

Droplet manipulation. The sample is dissolved in DI water, which the solution concentration is 30 mg/ml. The N-hexane is added to the culture dish, and a drop of sample is added to the culture dish. The process is under the normal light.

2. Supporting Figures

Figure S1. ^{13}C NMR spectrum of Vim[I] in DMSO-*d*6.

Figure S2. The gel permeation chromatography trace of PVim.

Figure S3. Temperature *versus* magnetic field intensity curve under zero field cooling and field cooling for (a) Vim[$Tb(NO_3)_4$] and (b) PVim[$Tb(NO_3)_4$].

Figure S4. The contact angle testing under an external magnet for (a)Vim[$Tb(NO_3)_4$] and (b) PVim[$Tb(NO_3)_4$], the solvent is DI water.

Figure S5. The images of (a) Vim[$Tb(NO_3)_4$] and (b) PVim[$Tb(NO_3)_4$] droplet under sunlight.

Figure S6. DSC curves of the Vim[$Tb(NO_3)_4$] and PVim[$Tb(NO_3)_4$].

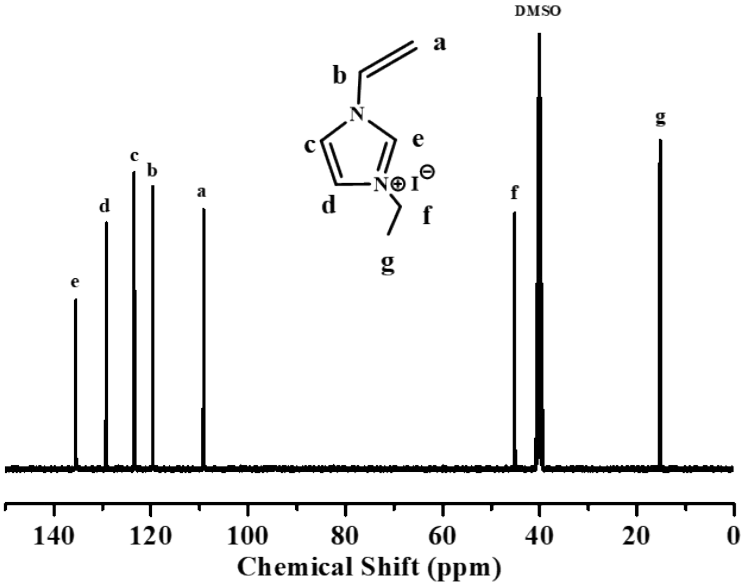


Figure S1. ^{13}C NMR spectrum of Vim[I] in DMSO-*d*6.

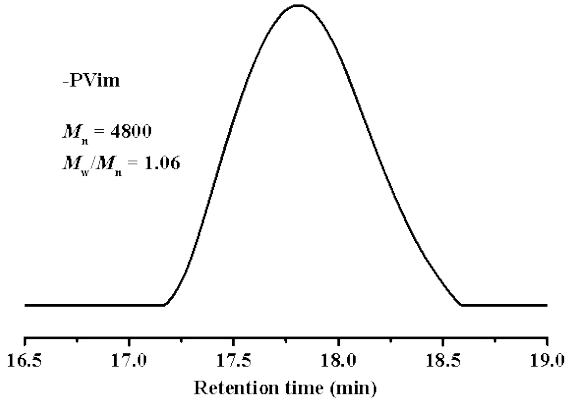


Figure S2. The gel permeation chromatography trace of PVim.

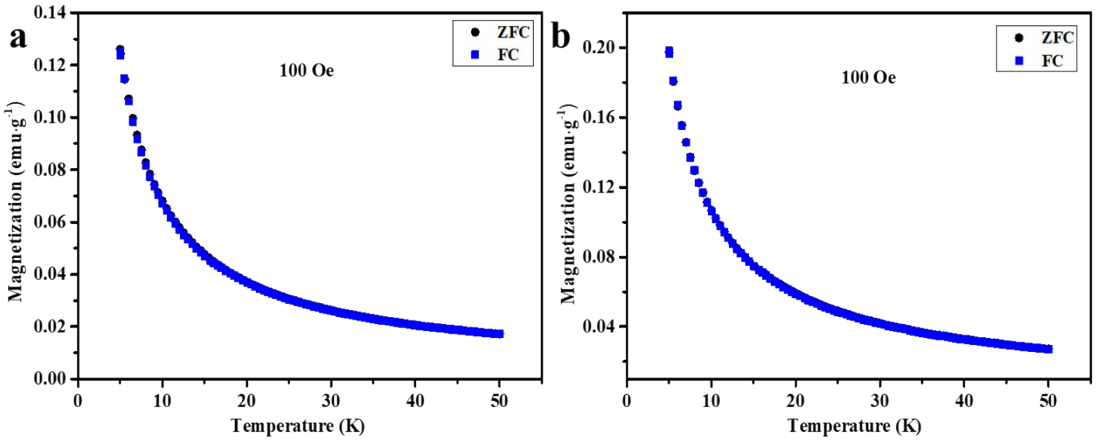
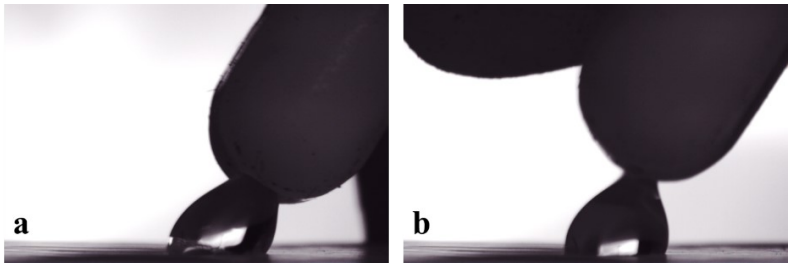


Figure S3. Temperature *versus* magnetic field intensity curve under zero field cooling and field cooling for (a) Vim[$Tb(NO_3)_4$] and (b) PVim[$Tb(NO_3)_4$].



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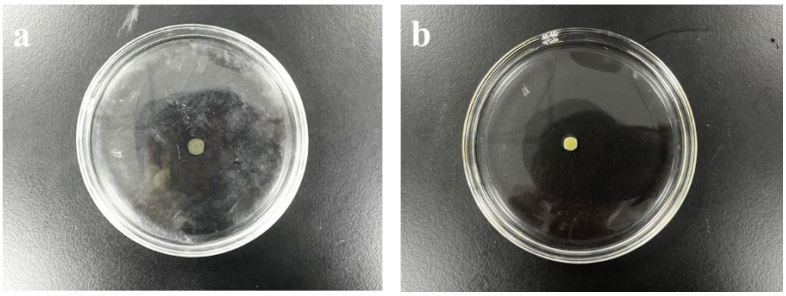

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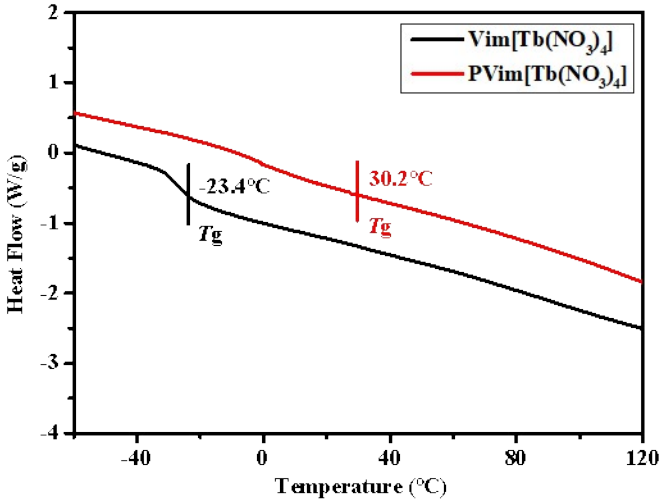

Figure S6. DSC curves of the Vim[Tb(NO_3)$_4$] and PVim[Tb(NO_3)$_4$].