Supporting Information

Two Series of Lanthanide Coordination Polymers with 2-Methylenesuccinate: Magnetic Refrigerant, Slow Magnetic Relaxation, and Luminescent Properties

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Table S1. Selected bond lengths (Å) and angles (°) for **1**.

Gd(1)-O(3)	2.303(3)	Gd(1)-O(1)	2.434(3)
Gd(1)-O(4)#1	2.357(3)	Gd(1)-O(5)	2.467(3)
Gd(1)-O(9)	2.362(3)	Gd(1)-O(1)#2	2.740(3)
Gd(1)-O(8)	2.397(3)	Gd(1)-O(6)	2.745(4)
Gd(1)-O(2)#2	2.432(3)		
O(3)-Gd(1)-O(4)#1	157.63(11)	O(2)#2-Gd(1)-O(5)	76.20(11)
O(3)-Gd(1)-O(9)	83.28(12)	O(1)-Gd(1)-O(5)	141.13(11)
O(4)#1-Gd(1)-O(9)	86.35(13)	O(3)-Gd(1)-O(1)#2	69.19(9)
O(3)-Gd(1)-O(8)	84.79(12)	O(4)#1-Gd(1)-O(1)#2	129.97(10)
O(4)#1-Gd(1)-O(8)	92.85(12)	O(9)-Gd(1)-O(1)#2	136.06(11)
O(9)-Gd(1)-O(8)	145.66(11)	O(8)-Gd(1)-O(1)#2	66.79(10)
O(3)-Gd(1)-O(2)#2	118.54(10)	O(2)#2-Gd(1)-O(1)#2	49.46(9)
O(4)#1-Gd(1)-O(2)#2	82.06(10)	O(1)-Gd(1)-O(1)#2	127.13(4)
O(9)-Gd(1)-O(2)#2	137.82(11)	O(5)-Gd(1)-O(1)#2	66.33(10)
O(8)-Gd(1)-O(2)#2	75.62(11)	O(3)-Gd(1)-O(6)	122.85(10)
O(3)-Gd(1)-O(1)	76.47(10)	O(4)#1-Gd(1)-O(6)	71.17(11)
O(4)#1-Gd(1)-O(1)	81.70(10)	O(9)-Gd(1)-O(6)	70.14(12)
O(9)-Gd(1)-O(1)	74.67(11)	O(8)-Gd(1)-O(6)	141.46(12)
O(8)-Gd(1)-O(1)	71.26(10)	O(2)#2-Gd(1)-O(6)	67.73(11)
O(2)#2-Gd(1)-O(1)	142.10(10)	O(1)-Gd(1)-O(6)	136.31(11)
O(3)-Gd(1)-O(5)	76.79(11)	O(5)-Gd(1)-O(6)	48.14(10)
O(4)#1-Gd(1)-O(5)	119.31(11)	O(1)#2-Gd(1)-O(6)	96.38(10)
O(9)-Gd(1)-O(5)	74.63(12)	Gd(1)-O(1)-Gd(1)#1	129.76(11)
O(8)-Gd(1)-O(5)	133.06(11)		

Symmetry codes: #1 -x+1/2, y+1/2, -z+1/2; #2 -x+1/2, y-1/2, -z+1/2.

Table S2. Selected bond lengths (Å) and angles (°) for **4**.

Gd(1)-O(12)	2.456(3)	Gd(1)-O(9)#3	2.473(3)
Gd(1)-O(13)#2	2.490(3)	Gd(2)-O(10)	2.341(3)
Gd(1)-O(3)#1	2.421(3)	Gd(2)-O(11)#5	2.435(3)
Gd(1)-O(4)	2.387(3)	Gd(2)-O(14)	2.358(3)
Gd(1)-O(4)#1	2.715(3)	Gd(2)-O(15)	2.384(3)
Gd(1)-O(5)	2.412(3)	Gd(2)-O(16)	2.387(3)
Gd(1)-O(6)	2.313(3)	Gd(2)-O(7)	2.384(3)
Gd(1)-O(8)#3	2.462(3)	O(1)-Gd(2)#4	2.594(3)
O(2)-Gd(2)#4	2.435(3)		
O(6)-Gd(1)-O(3)#1	79.92(11)	O(13)#2-Gd(1)-O(4)#1	73.29(11)
O(4)-Gd(1)-O(3)#1	116.05(10)	O(10)-Gd(2)-O(7)	85.33(11)
O(5)-Gd(1)-O(3)#1	78.07(11)	O(14)-Gd(2)-O(7)	68.46(10)
O(6)-Gd(1)-O(12)#2	80.37(10)	O(10)-Gd(2)-O(15)	158.87(12)
O(4)-Gd(1)-O(12)#2	127.12(11)	O(14)-Gd(2)-O(15)	85.94(12)
O(5)-Gd(1)-O(12)#2	148.64(11)	O(7)-Gd(2)-O(15)	75.29(12)
O(3)#1-Gd(1)-O(12)#2	74.44(11)	O(10)-Gd(2)-O(16)	81.81(11)
O(6)-Gd(1)-O(8)#3	76.57(11)	O(14)-Gd(2)-O(16)	143.13(11)
O(4)-Gd(1)-O(8)#3	77.39(10)	O(7)-Gd(2)-O(16)	74.66(11)
O(5)-Gd(1)-O(8)#3	74.91(10)	O(15)-Gd(2)-O(16)	84.97(12)
O(3)#1-Gd(1)-O(8)#3	146.65(10)	O(10)-Gd(2)-O(11)#5	113.80(11)
O(12)#2-Gd(1)-O(8)#3	123.55(10)	O(14)-Gd(2)-O(11)#5	140.23(11)
O(6)-Gd(1)-O(9)#3	83.01(11)	O(7)-Gd(2)-O(11)#5	137.41(11)
O(4)-Gd(1)-O(9)#3	92.84(11)	O(15)-Gd(2)-O(11)#5	76.95(11)
O(5)-Gd(1)-O(9)#3	127.27(10)	O(16)-Gd(2)-O(11)#5	71.29(11)
O(3)#1-Gd(1)-O(9)#3	146.20(10)	O(10)-Gd(2)-O(2)#6	72.26(10)
O(12)#2-Gd(1)-O(9)#3	74.07(11)	O(14)-Gd(2)-O(2)#6	79.13(10)
O(8)#3-Gd(1)-O(9)#3	52.59(9)	O(7)-Gd(2)-O(2)#6	138.70(11)
O(6)-Gd(1)-O(13)#2	132.10(10)	O(15)-Gd(2)-O(2)#6	128.33(12)
O(4)-Gd(1)-O(13)#2	76.38(11)	O(16)-Gd(2)-O(2)#6	132.76(10)
O(5)-Gd(1)-O(13)#2	141.07(11)	O(11)#5-Gd(2)-O(2)#6	83.85(10)
O(3)#1-Gd(1)-O(13)#2	86.45(12)	O(10)-Gd(2)-O(1)#6	123.61(10)
O(12)#2-Gd(1)-O(13)#2	51.73(10)	O(14)-Gd(2)-O(1)#6	72.62(11)
O(8)#3-Gd(1)-O(13)#2	126.90(11)	O(7)-Gd(2)-O(1)#6	133.06(10)
O(9)#3-Gd(1)-O(13)#2	83.68(11)	O(15)-Gd(2)-O(1)#6	76.79(12)
O(6)-Gd(1)-O(4)#1	124.72(10)	O(16)-Gd(2)-O(1)#6	138.71(11)
O(4)-Gd(1)-O(4)#1	66.21(11)	O(11)#5-Gd(2)-O(1)#6	68.64(10)
O(5)-Gd(1)-O(4)#1	69.39(10)	O(2)#6-Gd(2)-O(1)#6	51.54(9)
O(3)#1-Gd(1)-O(4)#1	49.87(9)	Gd(1)-O(4)-Gd(1)#1	113.79(11)

Symmetry codes: #1 -x+1, -y, -z+1; #2 -x, -y, -z; #3 -x+1, -y+1, -z+1; #4 x+1, y, z+1; #5 -x, -y+1, -z; #6 x-1, y, z-1.

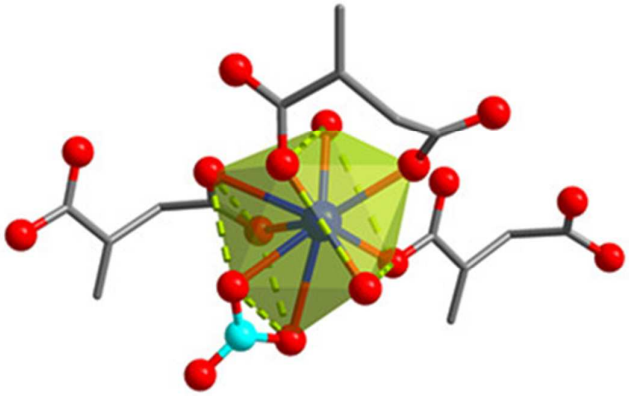

Figure S1. Coordination environment of Gd^{3+} ion of **1**.

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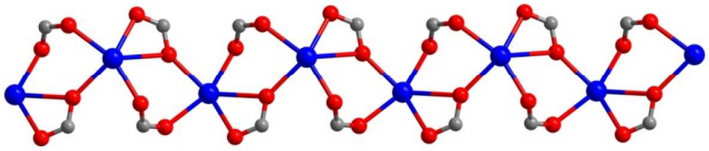
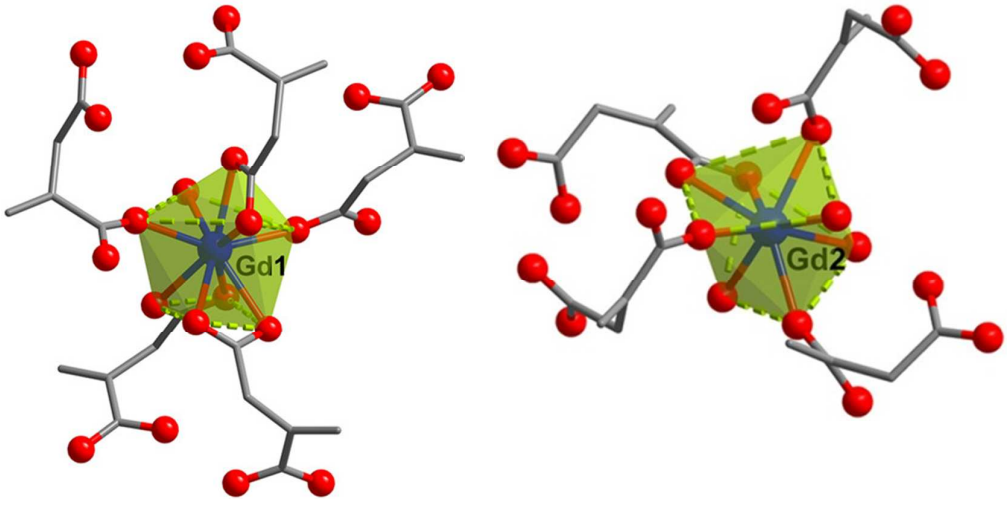


Figure S2. The 1D chain-shaped building units $[Gd_2(CO_2)_4]_n$ constructed from the adjacent Gd^{3+} ions and carboxyl groups of the H_2MSA ligands in **1**.



(a) (b)

Figure S3. Coordination environment of Gd^{3+} ion in **4**, (a) for Gd1 and (b) for Gd2.

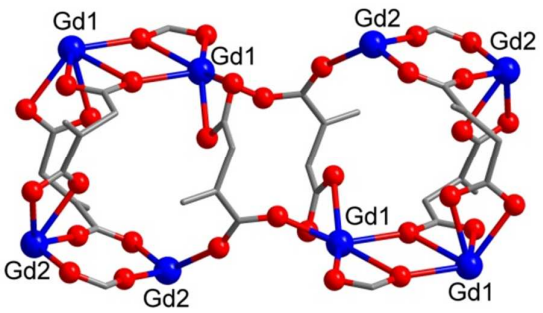


Figure S4. View of the connection of the neighboring 1D $[Gd_4(CO_2)_6]_n$ units.

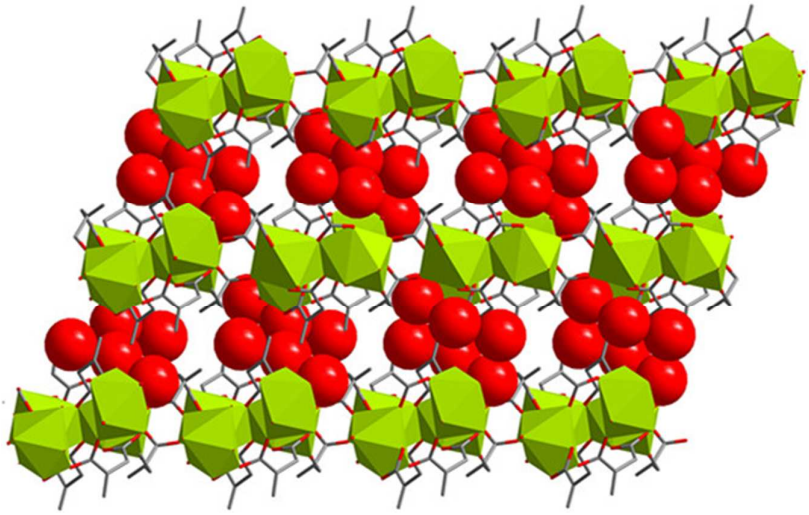


Figure S5. Packing View of the 2D structures viewed along [111] axis. The free water molecules are shown in space-filling mode. The hydrogen atoms have been omitted for clarity.

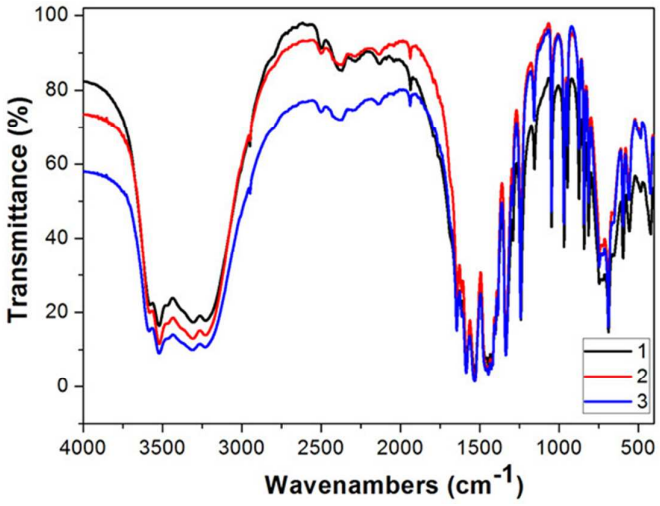


Figure S6. The IR spectra of **1-3**.

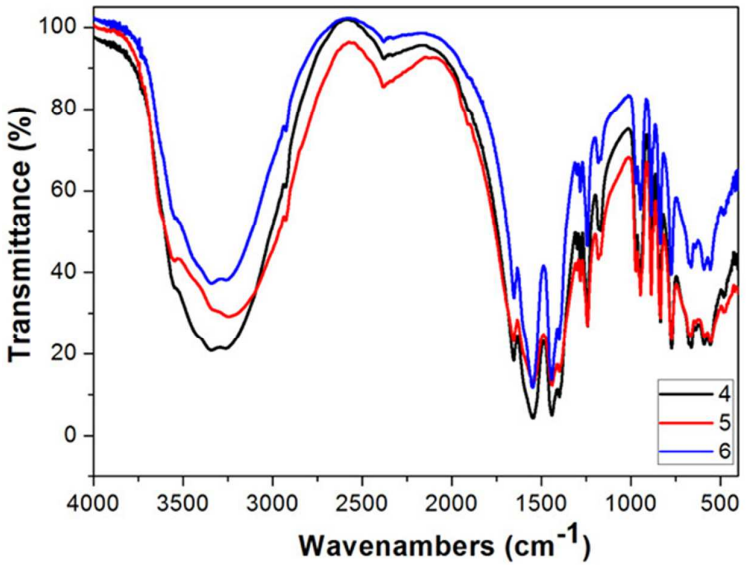


Figure S7. The IR spectra of **4-6**.

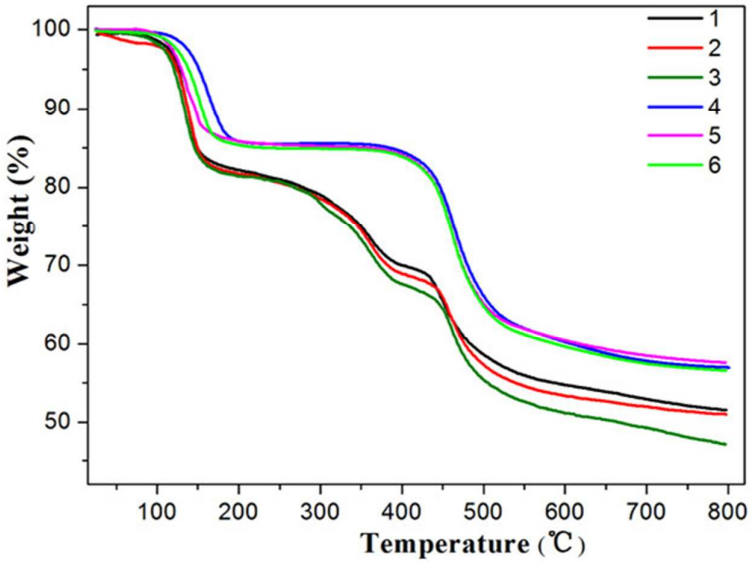


Figure S8. TG curves for **1**–**6** in a nitrogen atmosphere (10 °C/min).

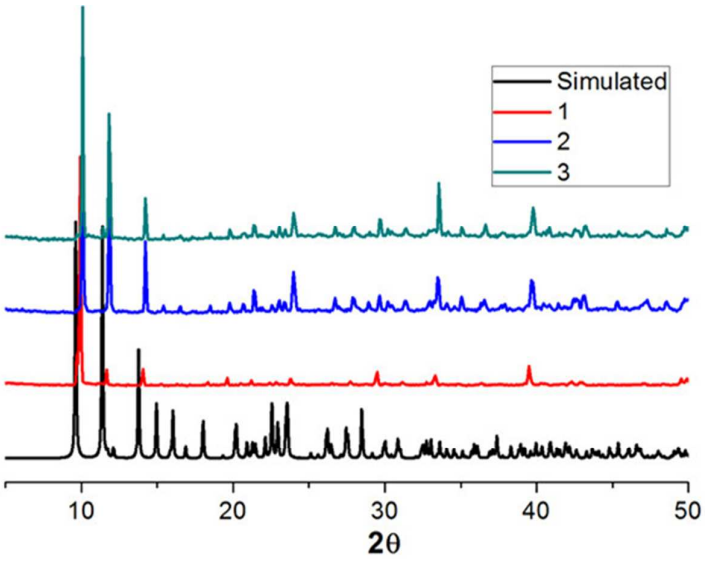


Figure S9. Powder X-ray diffraction patterns of **1**-**3**.

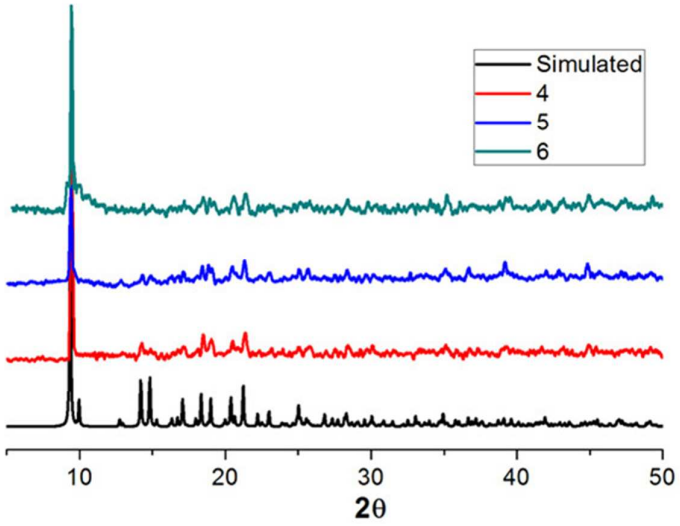


Figure S10. Powder X-ray diffraction patterns of **4**-**6**.

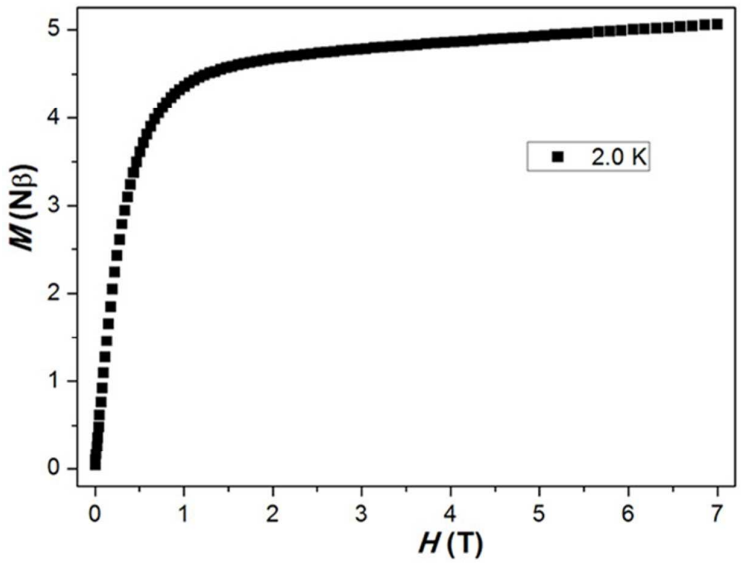


Figure S11. Field dependence of the magnetization of **3** at 2.0 K.

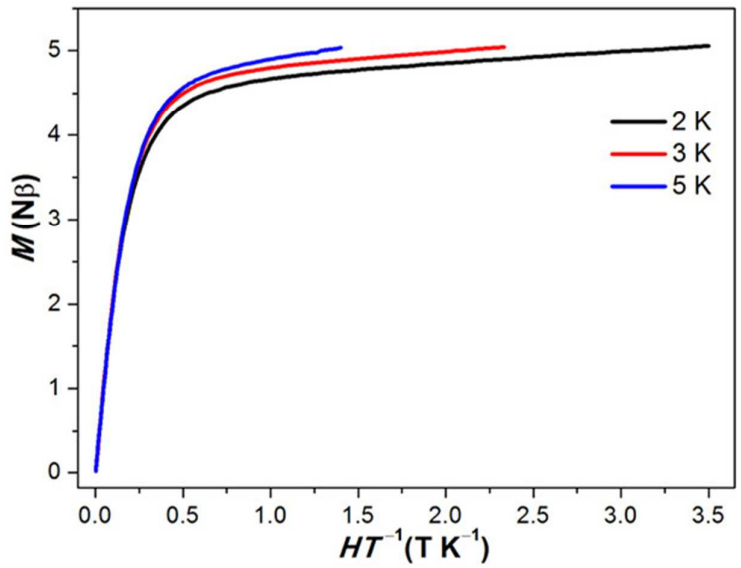


Figure S12. *M* versus *H/T* plots at different temperatures for **3**.

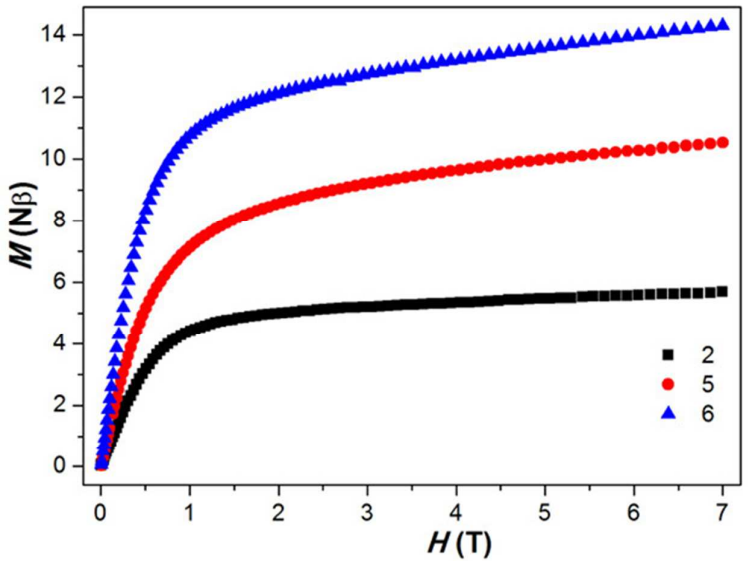


Figure S13. Field dependence of the magnetization of **2, 5** and **6** at 2.0 K.

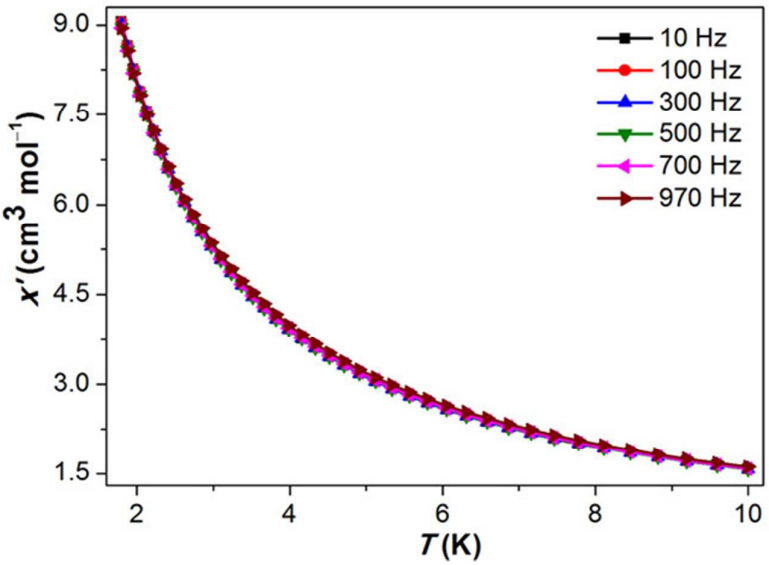


Figure S14. Temperature dependence of the in-phase (χ′) ac susceptibility for **3** at the indicated frequencies and in the zero dc field.