12-metal 36-membered rings based W^{V}–Co^{II} layers showing spin-glass behaviour

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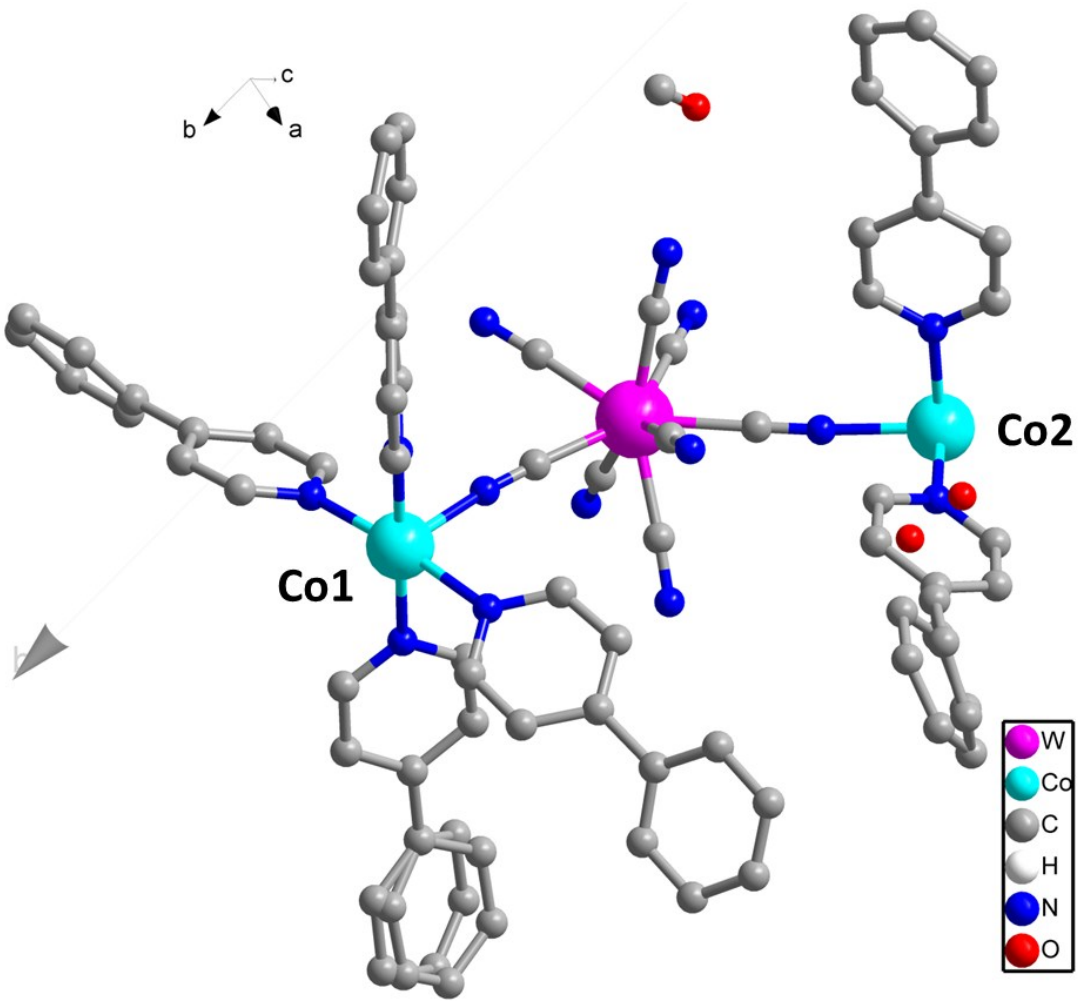

Figure S1. The coordination geometry of complex **1**. H atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

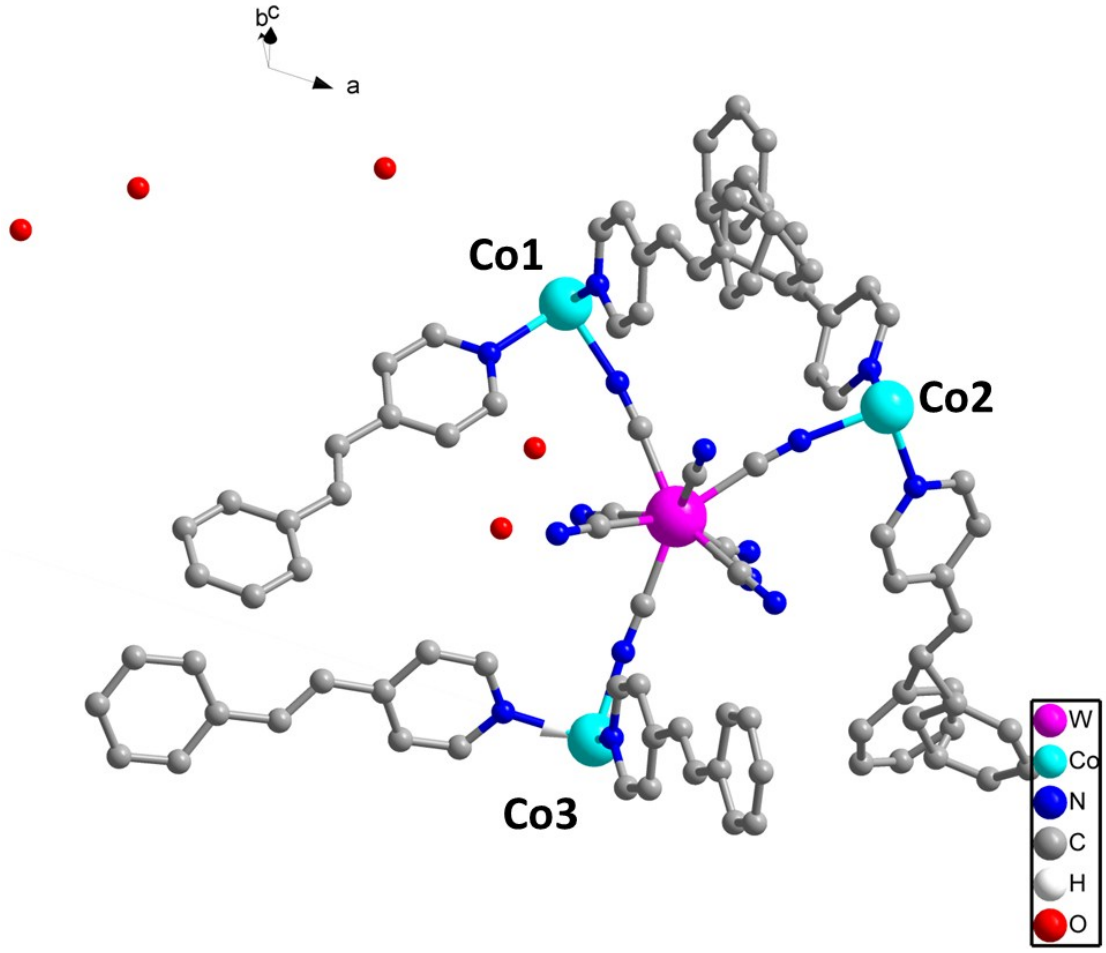

Figure S2. The coordination geometry of complex **2**. H atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

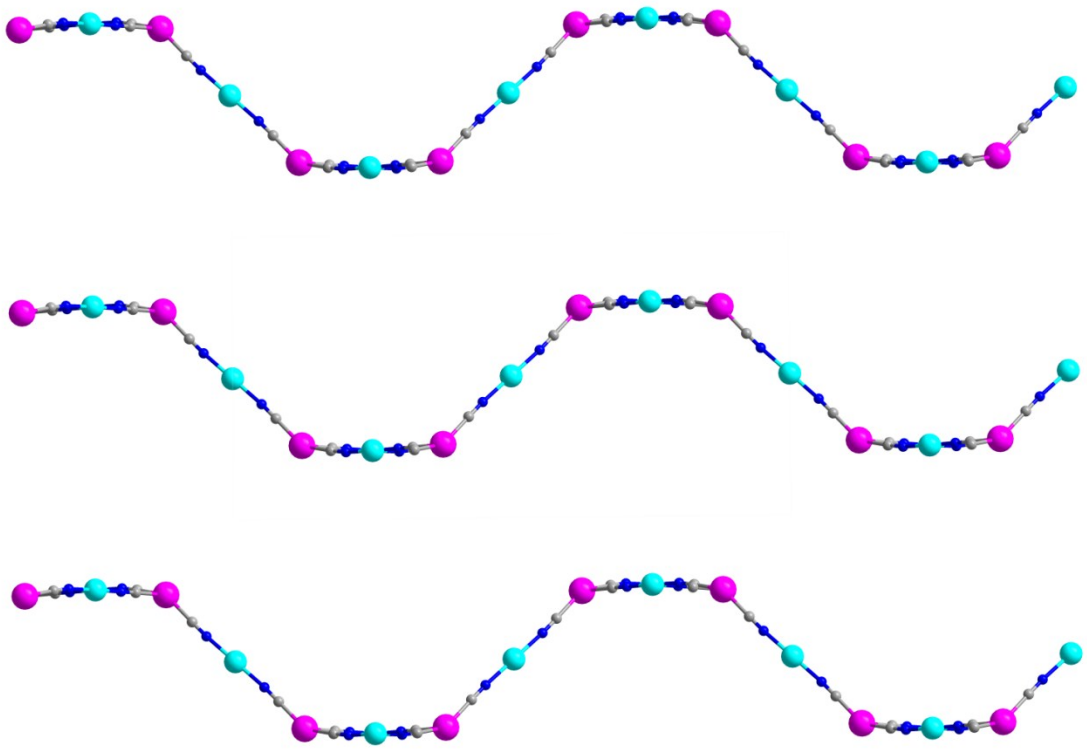

Figure S3. The structure of complex **1** to the *ab* crystallographic plane. The redundant atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

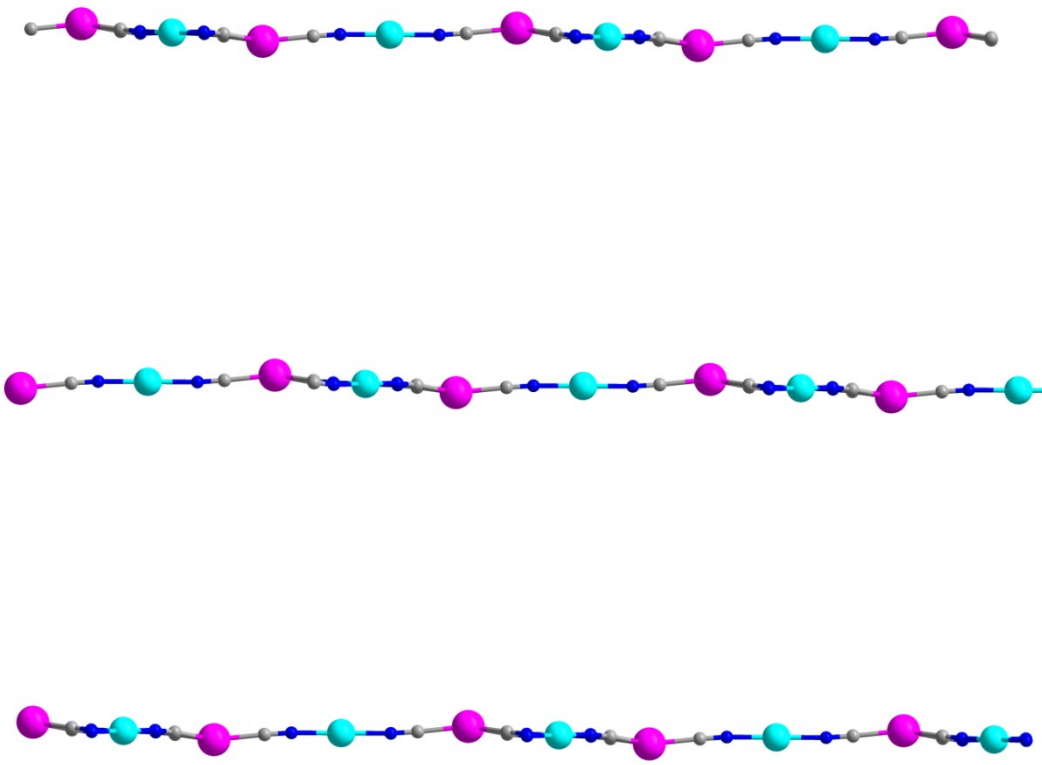

Figure S4. The platelike structure of complex **2** to the *bc* crystallographic plane. The redundant atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

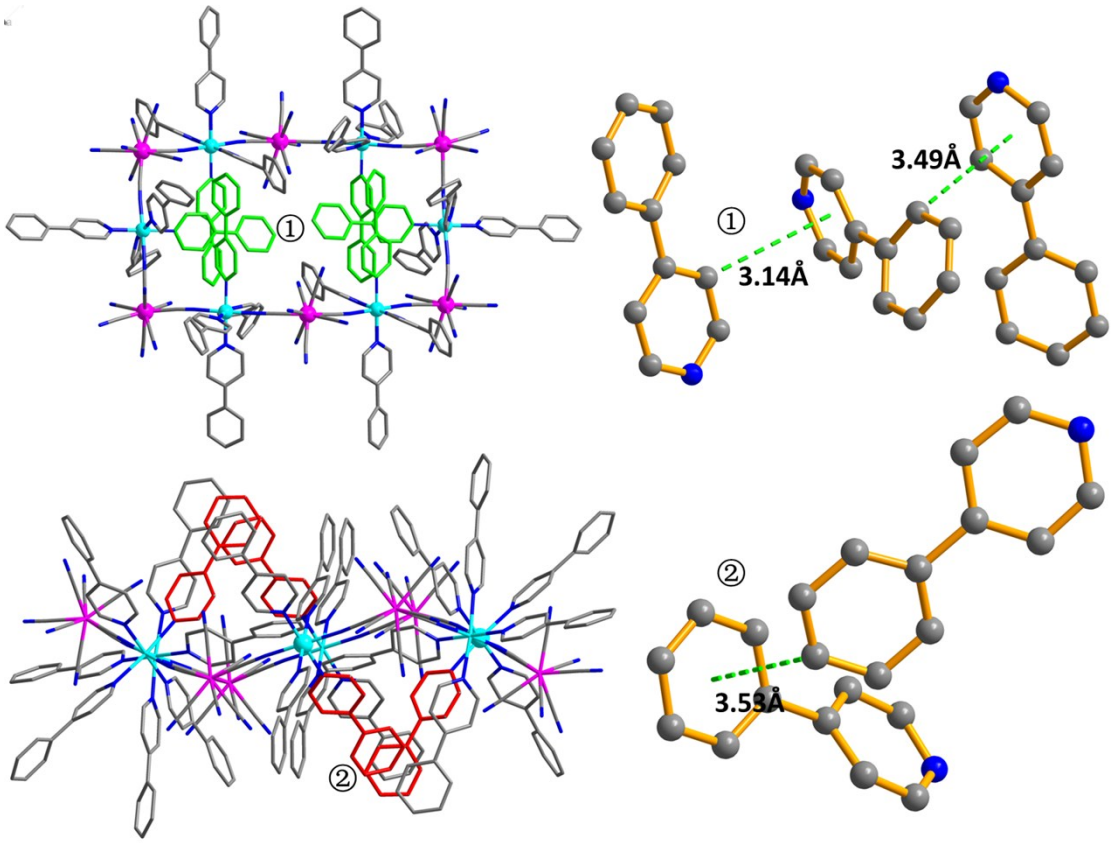

Figure S5. The π–π staking interaction in compound **1**. The redundant atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

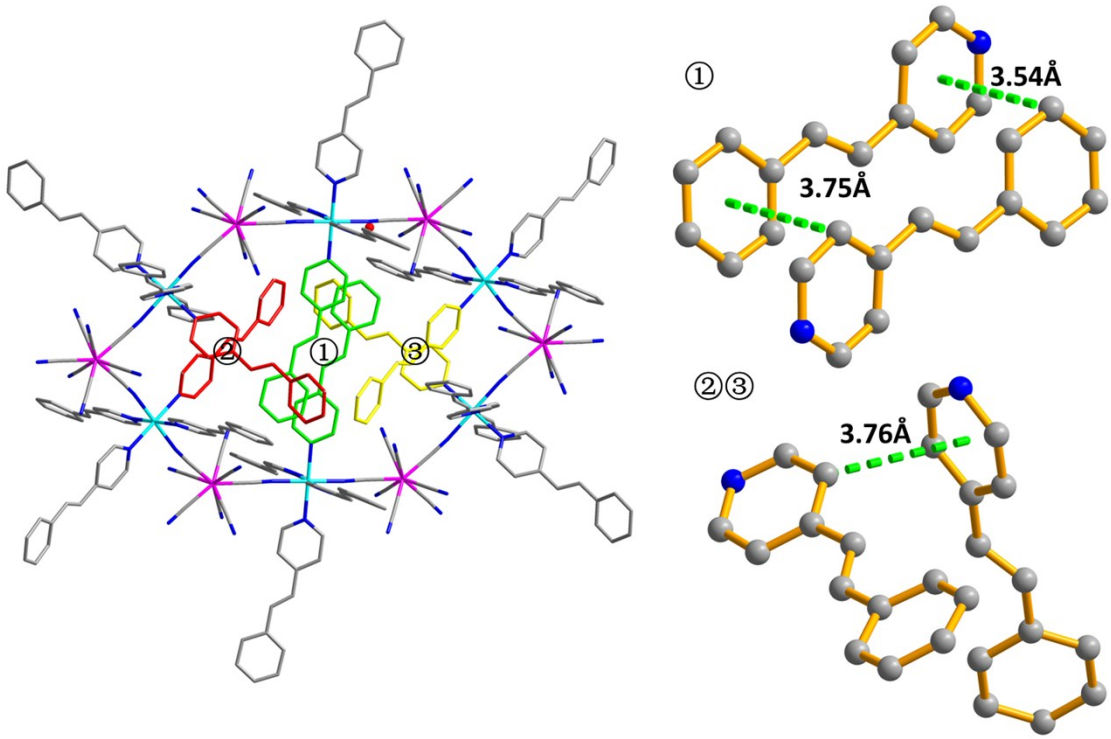

Figure S6. The π–π staking interaction in compound **2**. The redundant atoms have been omitted for clarity. (W(V), pink; Co(II), cyan; C, gray; N, blue.)

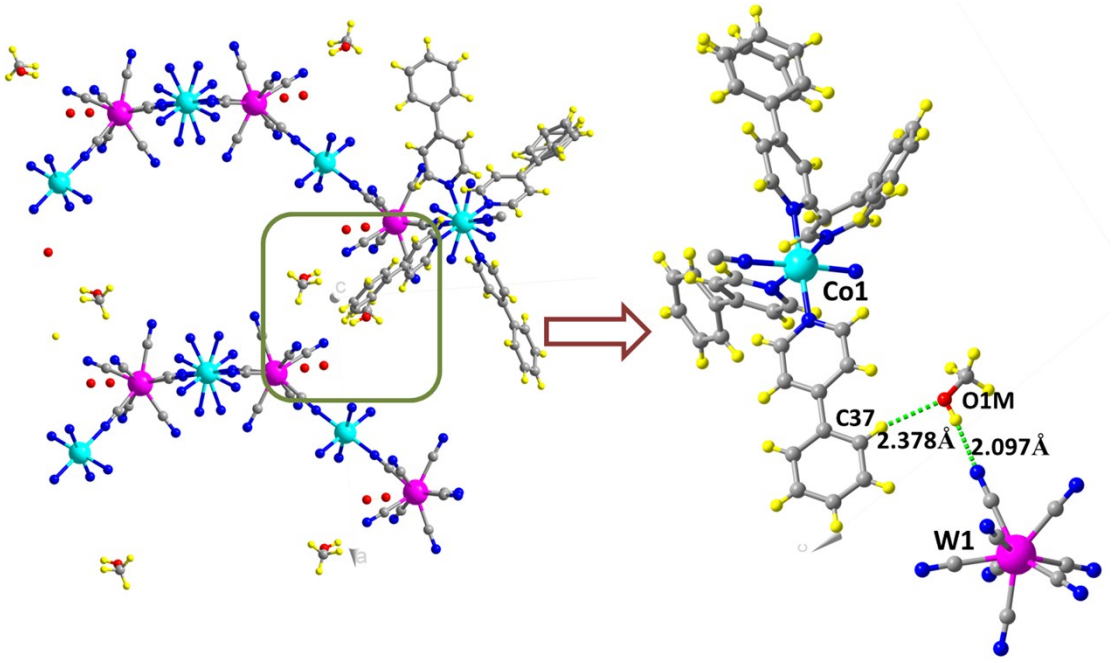

Figure S7. The hydrogen interaction in compound **1**. The redundant atoms have been omitted for clarity. (W, pink; Co, cyan; C, gray; N, blue; O, red; H, yellow.)

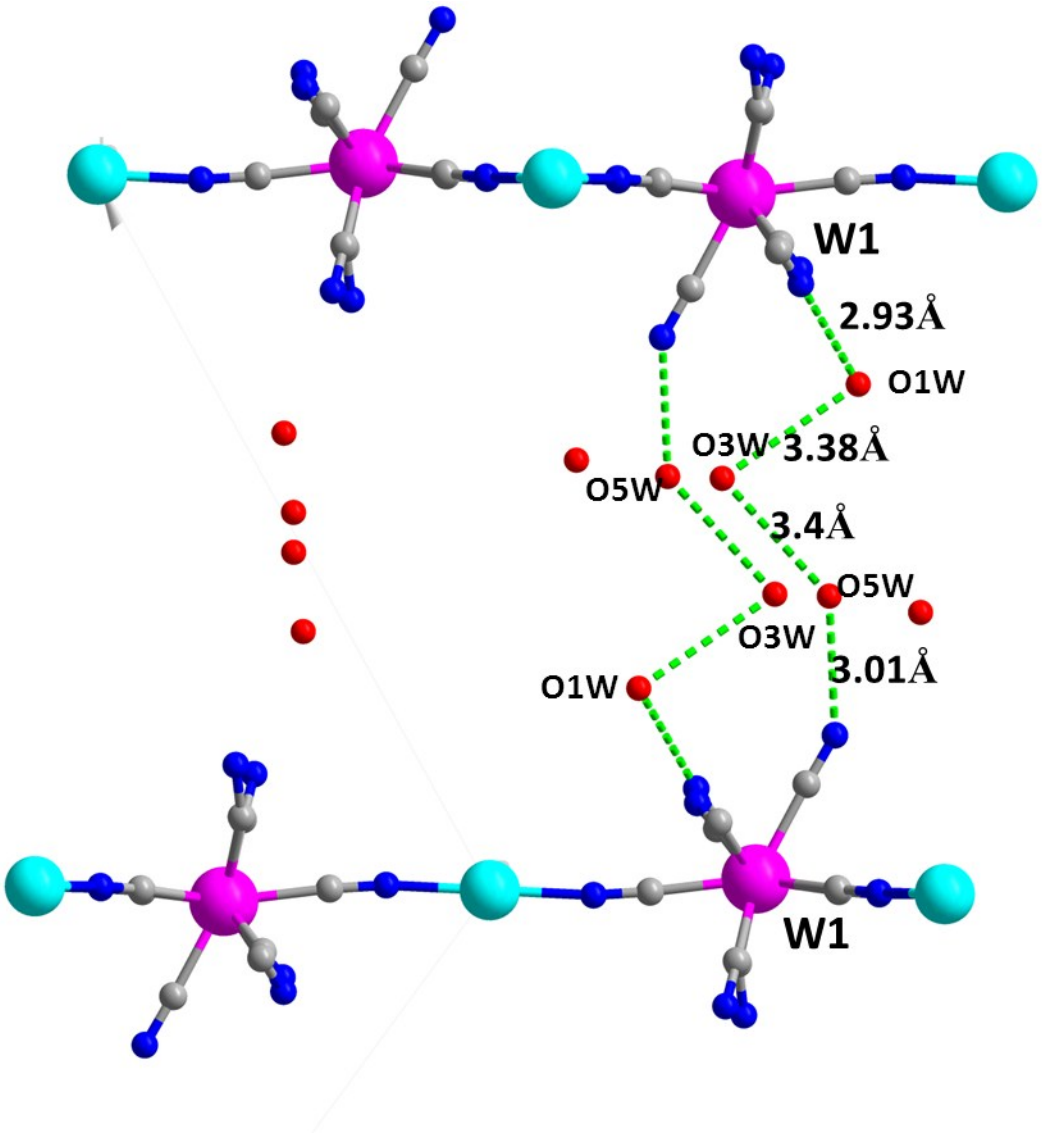

Figure S8. The hydrogen interaction in compound **2**. The redundant atoms have been omitted for clarity. (W, pink; Co, cyan; C, gray; N, blue; O, red; H, yellow.)

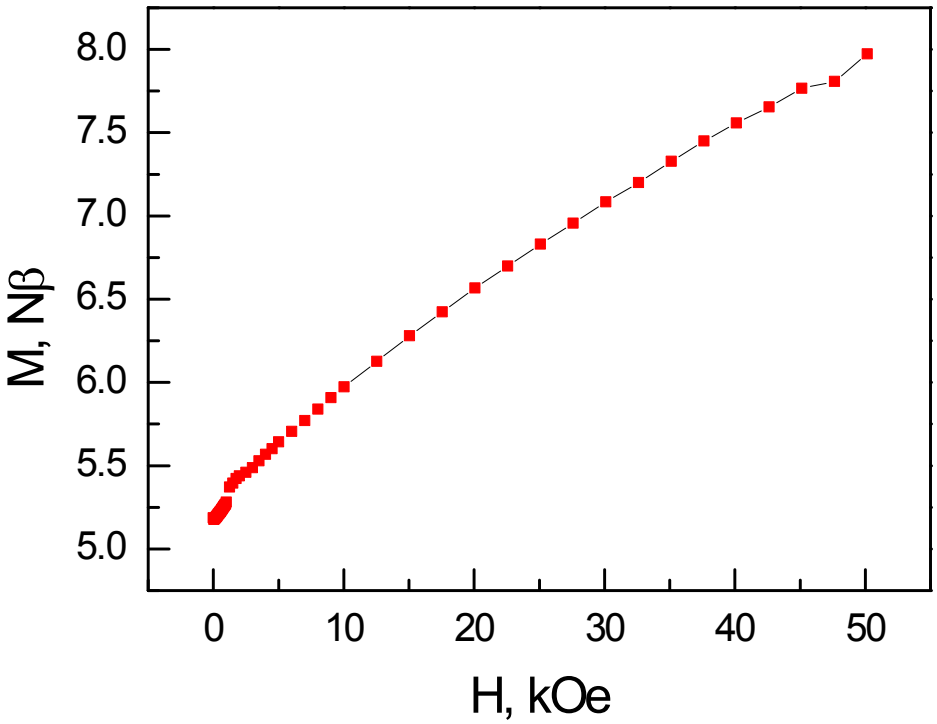

Figure S9. Field dependence of magnetization of complex **1** at 2 K.

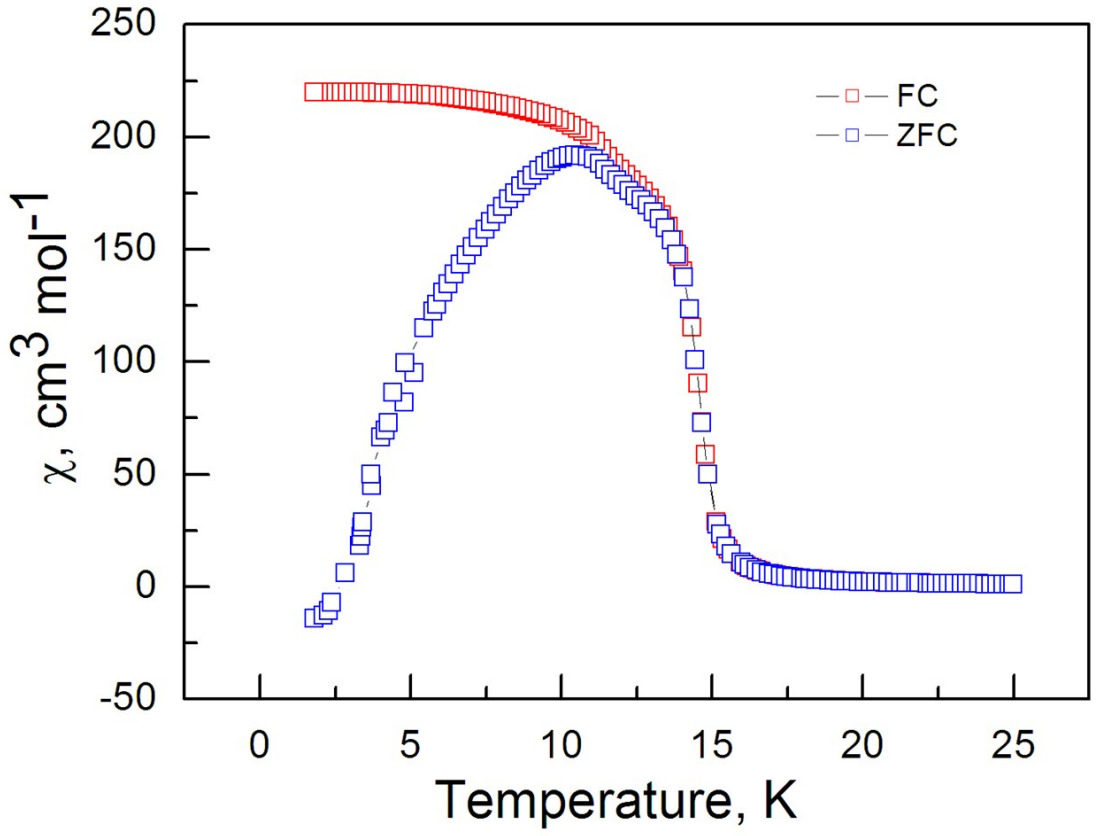

Figure S10. The irreversibility of ZFC and FC magnetization curves of compound **1** at 20 Oe.

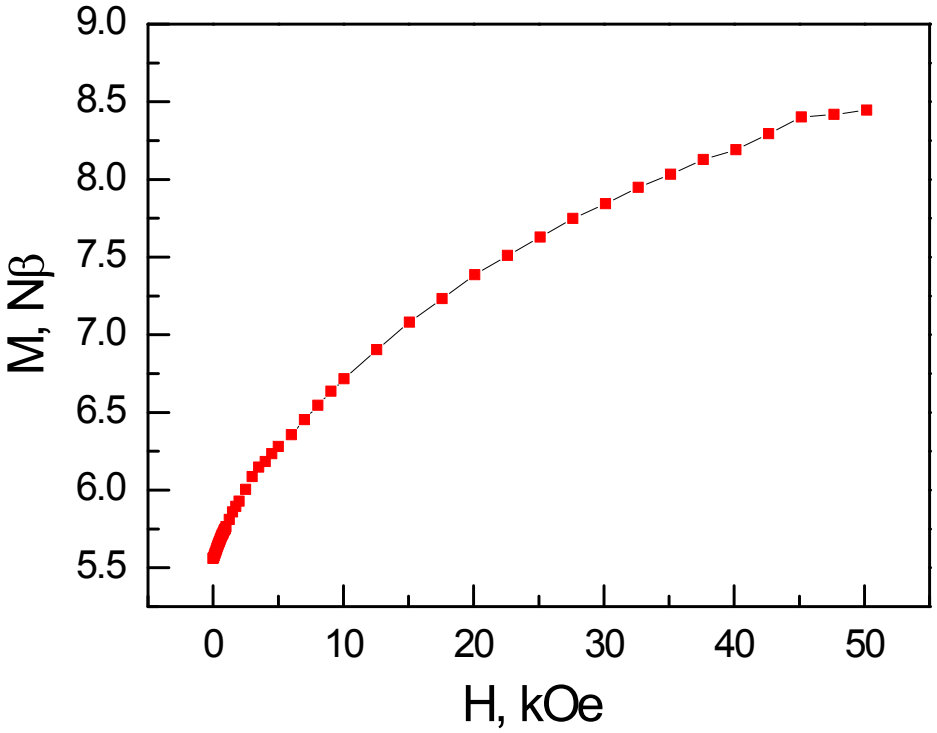

Figure S11. Field dependence of magnetization of complex **2** at 2 K.

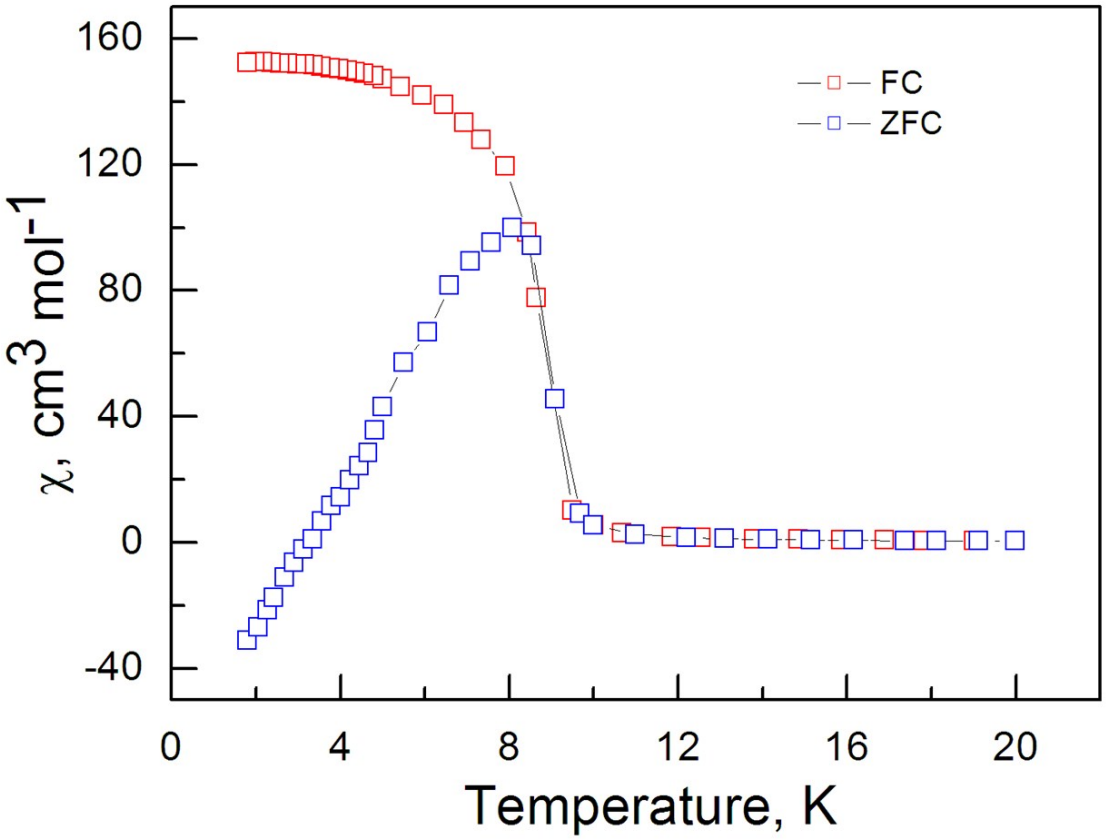

Figure S12. The irreversibility of ZFC and FC magnetization curves of compound **2** at 20 Oe.

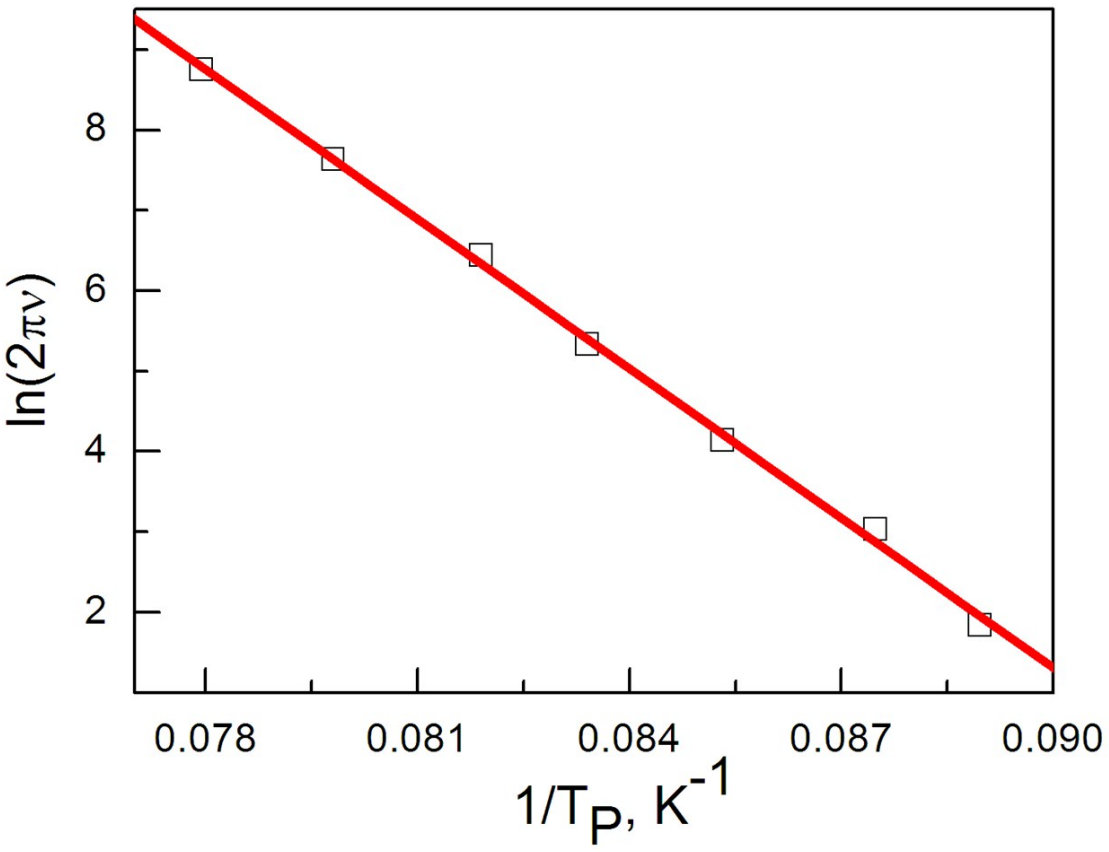

Figure S13. Arrhenius plot generated from AC susceptibility measurement of **1**.

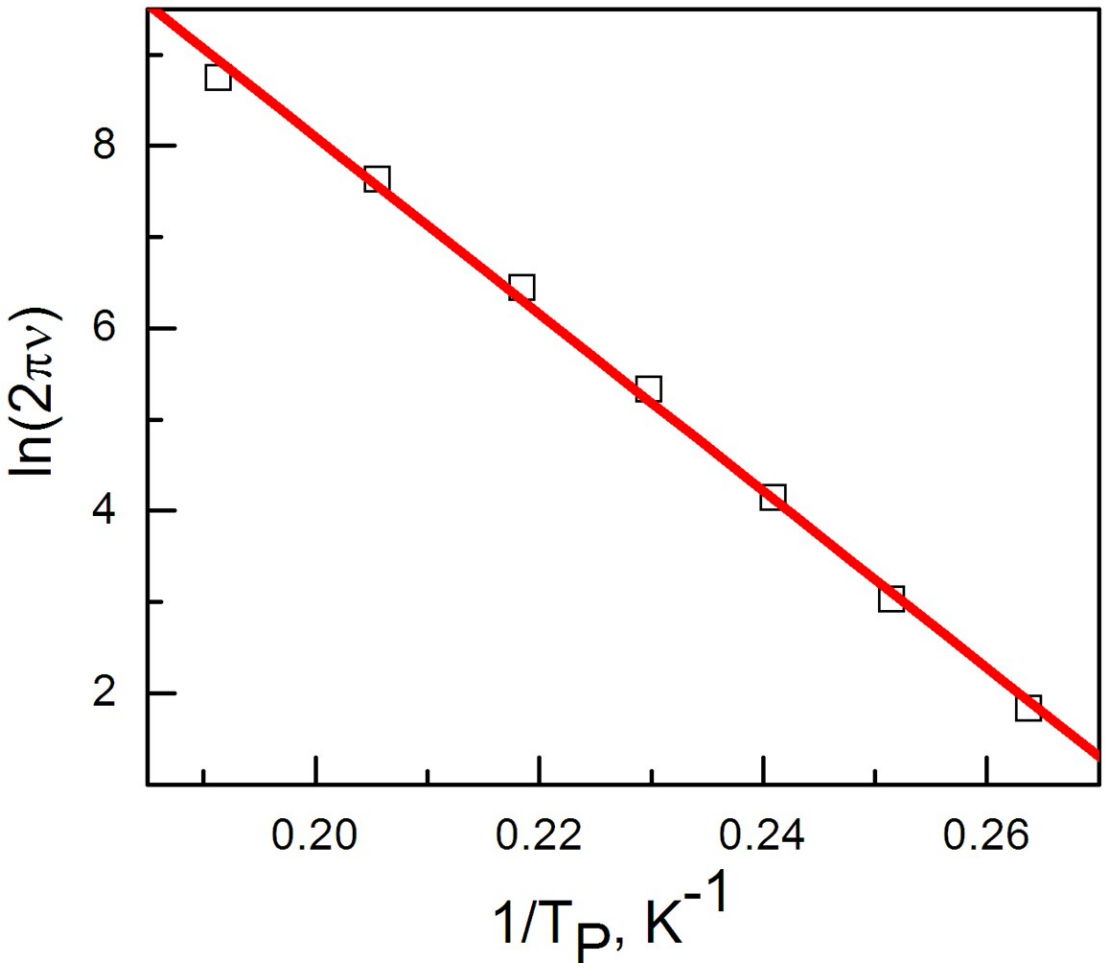

Figure S14. Arrhenius plot generated from AC susceptibility measurement of **2**.

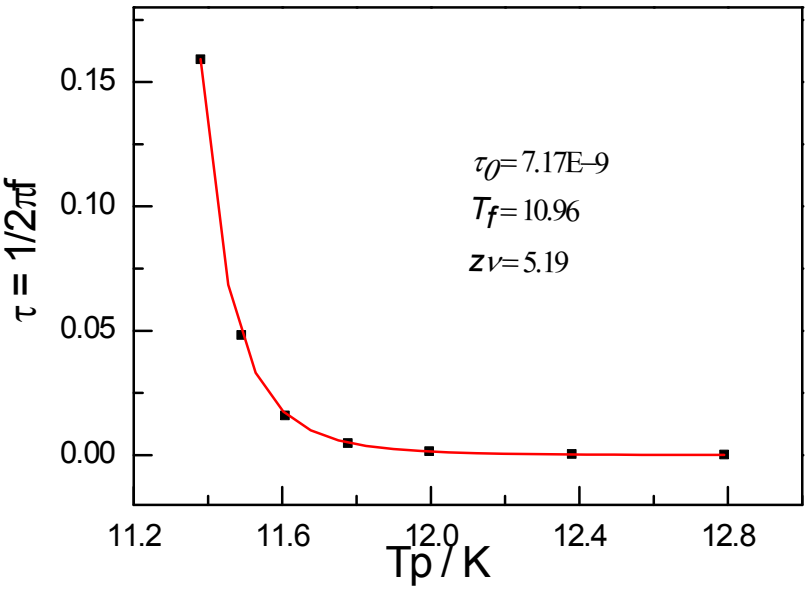

Figure S15. Frequency dependence of ac χ'' for **1** was fitted by the conventional critical scaling law of the spin dynamics as described by $\tau = \tau_0((T_p - T_f)/T_f)^{-z\nu}$. The red solid line is from fitting results.

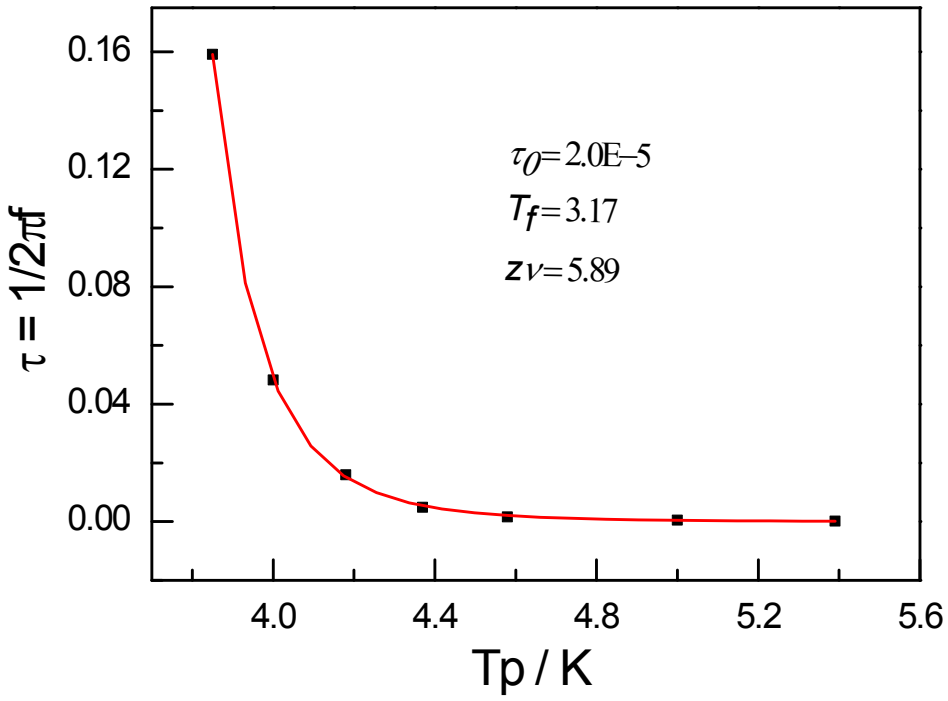

Figure S16. Frequency dependence of ac χ'' for **2** was fitted by the conventional critical scaling law of the spin dynamics as described by $\tau = \tau_0((T_p - T_f)/T_f)^{-z\nu}$. The red solid line is from fitting results.

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

W(1)-C(8)	2.156(5)	Co(1)-N(8)#1	2.140(4)
W(1)-C(3)	2.158(6)	Co(1)-N(9)	2.168(5)
W(1)-C(5)	2.159(6)	Co(1)-N(11)	2.172(4)
W(1)-C(2)	2.160(6)	Co(1)-N(12)	2.207(5)
W(1)-C(7)	2.162(6)	Co(2)-N(4)#2	2.122(4)
W(1)-C(4)	2.163(5)	Co(2)-N(4)	2.122(4)
W(1)-C(6)	2.166(6)	Co(2)-N(14)	2.156(5)
W(1)-C(1)	2.168(5)	Co(2)-N(14)#2	2.156(5)
Co(1)-N(1)	2.125(4)	Co(2)-N(13)#2	2.205(4)
Co(1)-N(10)	2.131(4)	Co(2)-N(13)	2.205(4)
C(8)-W(1)-C(3)	73.38(19)	N(1)-Co(1)-N(8)#1	177.74(16)
C(8)-W(1)-C(5)	71.9(2)	N(10)-Co(1)-N(8)#1	89.35(17)
C(3)-W(1)-C(5)	125.3(2)	N(1)-Co(1)-N(9)	91.66(17)
C(8)-W(1)-C(2)	77.8(2)	N(10)-Co(1)-N(9)	90.06(18)
C(3)-W(1)-C(2)	74.1(2)	N(8)#1-Co(1)-N(9)	90.02(17)
C(5)-W(1)-C(2)	134.9(2)	N(1)-Co(1)-N(11)	90.08(16)
C(8)-W(1)-C(7)	143.9(2)	N(10)-Co(1)-N(11)	178.85(17)
C(3)-W(1)-C(7)	75.6(2)	N(8)#1-Co(1)-N(11)	91.46(16)
C(5)-W(1)-C(7)	143.2(2)	N(9)-Co(1)-N(11)	89.13(17)
C(2)-W(1)-C(7)	76.3(2)	N(1)-Co(1)-N(12)	90.45(17)
C(8)-W(1)-C(4)	101.83(18)	N(10)-Co(1)-N(12)	95.66(18)
C(3)-W(1)-C(4)	72.0(2)	N(8)#1-Co(1)-N(12)	88.03(16)
C(5)-W(1)-C(4)	75.3(2)	N(9)-Co(1)-N(12)	173.93(16)
C(2)-W(1)-C(4)	144.6(2)	N(11)-Co(1)-N(12)	85.18(17)
C(7)-W(1)-C(4)	85.5(2)	N(4)#2-Co(2)-N(4)	180.000(1)
C(8)-W(1)-C(6)	143.6(2)	N(4)#2-Co(2)-N(14)	90.15(17)
C(3)-W(1)-C(6)	135.9(2)	N(4)-Co(2)-N(14)	89.85(17)
C(5)-W(1)-C(6)	72.5(2)	N(4)#2-Co(2)-N(14)#2	89.85(17)
C(2)-W(1)-C(6)	125.0(2)	N(4)-Co(2)-N(14)#2	90.15(17)
C(7)-W(1)-C(6)	72.5(2)	N(14)-Co(2)-N(14)#2	180.0(2)
C(4)-W(1)-C(6)	75.80(19)	N(4)#2-Co(2)-N(13)#2	89.14(16)
C(8)-W(1)-C(1)	88.22(18)	N(4)-Co(2)-N(13)#2	90.86(16)
C(3)-W(1)-C(1)	142.9(2)	N(14)-Co(2)-N(13)#2	90.88(17)
C(5)-W(1)-C(1)	75.80(19)	N(14)#2-Co(2)-N(13)#2	89.12(17)
C(2)-W(1)-C(1)	70.6(2)	N(4)#2-Co(2)-N(13)	90.86(16)
C(7)-W(1)-C(1)	106.2(2)	N(4)-Co(2)-N(13)	89.14(16)
C(4)-W(1)-C(1)	144.5(2)	N(14)-Co(2)-N(13)	89.12(17)
C(6)-W(1)-C(1)	76.23(19)	N(14)#2-Co(2)-N(13)	90.88(17)
N(1)-Co(1)-N(10)	89.13(17)	N(13)#2-Co(2)-N(13)	180.00(17)
C(1)-N(1)-Co(1)	173.1(4)	C(9)-N(11)-Co(1)	120.2(4)
C(4)-N(4)-Co(2)	174.7(4)	C(20)-N(12)-C(24)	115.7(5)
C(46)-N(9)-C(42)	114.0(5)	C(20)-N(12)-Co(1)	124.0(4)

C(46)-N(9)-Co(1)	122.6(4)	C(24)-N(12)-Co(1)	119.1(4)
C(42)-N(9)-Co(1)	123.4(4)	C(57)-N(13)-C(53)	115.0(5)
C(35)-N(10)-C(31)	115.5(5)	C(57)-N(13)-Co(2)	124.4(4)
C(35)-N(10)-Co(1)	122.0(4)	C(53)-N(13)-Co(2)	120.6(4)
C(31)-N(10)-Co(1)	122.4(4)	C(68)-N(14)-C(64)	116.3(5)
C(13)-N(11)-C(9)	116.9(5)	C(68)-N(14)-Co(2)	122.4(4)
C(13)-N(11)-Co(1)	122.8(3)	C(64)-N(14)-Co(2)	121.2(4)

Symmetry transformations used to generate equivalent atoms: #1: x,-y+3/2,z-1/2; #2: -x+1,-y+1,-z+1; #3: x,-y+3/2,z+1/2.

Table S2. Selected bond lengths (Å) and angles (°) for **2**.

W(1)-C(7)	2.131(8)	Co(1)-N(13)#1	2.148(6)
W(1)-C(3)	2.153(7)	Co(1)-N(14)#1	2.182(6)
W(1)-C(1)	2.157(7)	Co(1)-N(14)	2.182(6)
W(1)-C(5)	2.157(8)	Co(2)-N(2)	2.111(6)
W(1)-C(6)	2.157(8)	Co(2)-N(2)#2	2.111(6)
W(1)-C(4)	2.162(8)	Co(2)-N(9)#2	2.157(7)
W(1)-C(2)	2.167(8)	Co(2)-N(10)#2	2.215(6)
W(1)-C(100)	2.168(9)	Co(3)-N(3)#3	2.094(6)
Co(1)-N(1)	2.125(5)	Co(3)-N(3)	2.094(6)
Co(1)-N(1)#1	2.125(5)	Co(3)-N(12)#3	2.162(5)
W(1)-C(7)	2.131(8)	Co(1)-N(13)#1	2.148(6)
C(7)-W(1)-C(3)	71.3(3)	N(1)-Co(1)-N(13)#1	91.3(2)
C(7)-W(1)-C(1)	80.4(3)	N(1)#1-Co(1)-N(13)#1	88.7(2)
C(3)-W(1)-C(1)	135.9(3)	N(1)-Co(1)-N(14)#1	89.8(2)
C(7)-W(1)-C(5)	144.8(3)	N(1)#1-Co(1)-N(14)#1	90.2(2)
C(3)-W(1)-C(5)	76.5(3)	N(13)#1-Co(1)-N(14)#1	93.4(2)
C(1)-W(1)-C(5)	115.4(3)	N(1)-Co(1)-N(14)	90.2(2)
C(7)-W(1)-C(6)	82.8(3)	N(1)#1-Co(1)-N(14)	89.8(2)
C(3)-W(1)-C(6)	72.8(3)	N(13)#1-Co(1)-N(14)	86.6(2)
C(1)-W(1)-C(6)	70.7(3)	N(14)#1-Co(1)-N(14)	180.0(5)
C(5)-W(1)-C(6)	74.3(3)	N(2)-Co(2)-N(2)#2	180.0(2)
C(7)-W(1)-C(4)	103.5(3)	N(2)-Co(2)-N(9)#2	90.5(2)
C(3)-W(1)-C(4)	74.4(3)	N(2)#2-Co(2)-N(9)#2	89.5(2)
C(1)-W(1)-C(4)	146.6(3)	N(2)-Co(2)-N(10)#2	90.5(2)
C(5)-W(1)-C(4)	80.7(3)	N(2)#2-Co(2)-N(10)#2	89.5(2)
C(6)-W(1)-C(4)	142.5(3)	N(9)#2-Co(2)-N(10)#2	85.4(2)
C(7)-W(1)-C(2)	144.4(3)	N(3)#3-Co(3)-N(3)	180.0(5)
C(3)-W(1)-C(2)	141.2(3)	N(3)#3-Co(3)-N(12)#3	91.5(2)
C(1)-W(1)-C(2)	78.4(3)	N(3)-Co(3)-N(12)#3	88.5(2)
C(5)-W(1)-C(2)	70.7(3)	N(3)#3-Co(3)-N(12)	88.5(2)
C(6)-W(1)-C(2)	116.0(3)	N(3)-Co(3)-N(12)	91.5(2)
C(4)-W(1)-C(2)	80.2(3)	N(12)#3-Co(3)-N(12)	180.0(3)
C(7)-W(1)-C(100)	73.6(3)	N(3)#3-Co(3)-N(11)	91.4(3)
C(3)-W(1)-C(100)	125.0(3)	N(3)-Co(3)-N(11)	88.6(3)
C(1)-W(1)-C(100)	75.1(3)	N(12)#3-Co(3)-N(11)	86.8(2)
C(5)-W(1)-C(100)	139.2(3)	N(12)-Co(3)-N(11)	93.2(2)
C(6)-W(1)-C(100)	141.1(3)	N(3)#3-Co(3)-N(11)#3	88.6(3)
C(4)-W(1)-C(100)	74.4(3)	N(3)-Co(3)-N(11)#3	91.4(3)
C(2)-W(1)-C(100)	73.5(3)	N(12)#3-Co(3)-N(11)#3	93.2(2)
N(1)-Co(1)-N(1)#1	180.0(3)	N(12)-Co(3)-N(11)#3	86.8(2)
C(1)-N(1)-Co(1)	172.4(6)	C(34)-N(11)-Co(3)	124.7(6)
C(2)-N(2)-Co(2)	171.8(6)	C(51)-N(12)-C(47)	114.7(6)

C(3)-N(3)-Co(3)	172.2(7)	C(51)-N(12)-Co(3)	119.6(5)
C(8)-N(9)-C(12)	116.4(8)	C(47)-N(12)-Co(3)	125.2(5)
C(25)-N(10)-C(21)	116.6(7)	C(60)-N(13)-C(64)	114.9(7)
C(38)-N(11)-C(34)	114.9(8)	C(77)-N(14)-C(73)	116.0(6)
C(38)-N(11)-Co(3)	119.7(6)	C(77)-N(14)-Co(1)	121.5(5)

Symmetry transformations used to generate equivalent atoms: #1: -x+2,-y+1,-z+1; #2: -x+3,-y+1,-z+1; #3: -x+2,-y,-z