Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Modulating spin dynamics of binuclear Ln^{III}-radical complexes by using different indazole radicals

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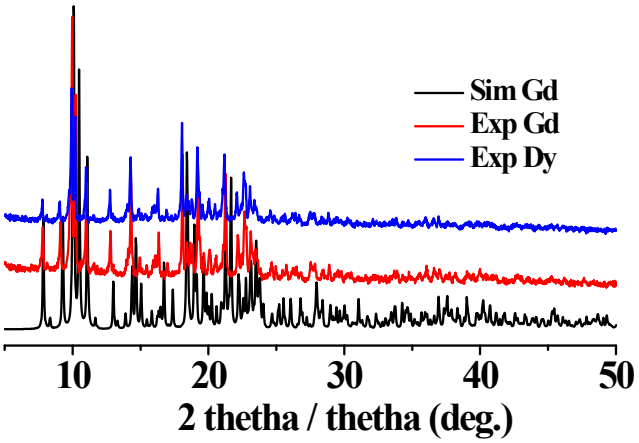

Figure S1. Powder X-ray diffractions of **1**–**2**.

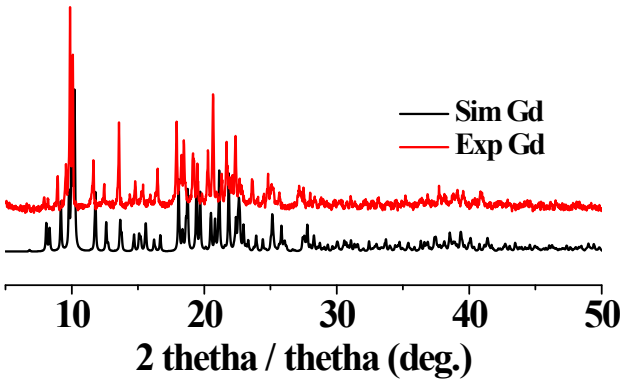

Figure S2. Powder X-ray diffractions of **3**.

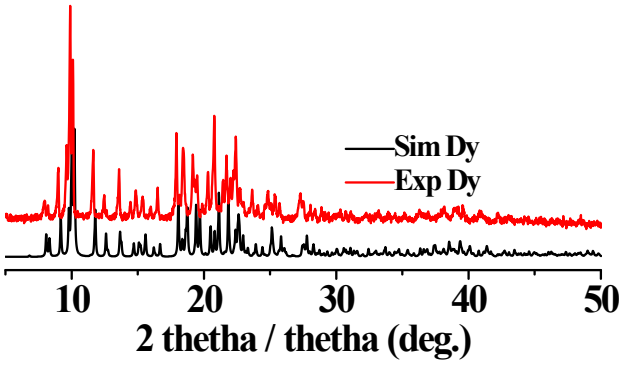

Figure S3. Powder X-ray diffractions of **4**.

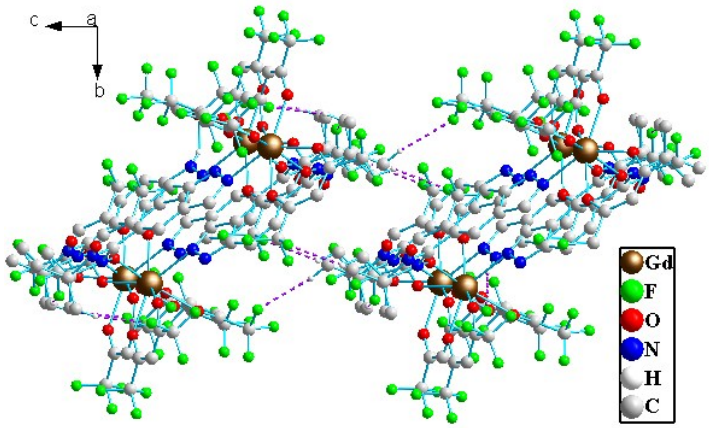

Figure S4. Viewing of the 3D packing structure of **1**.

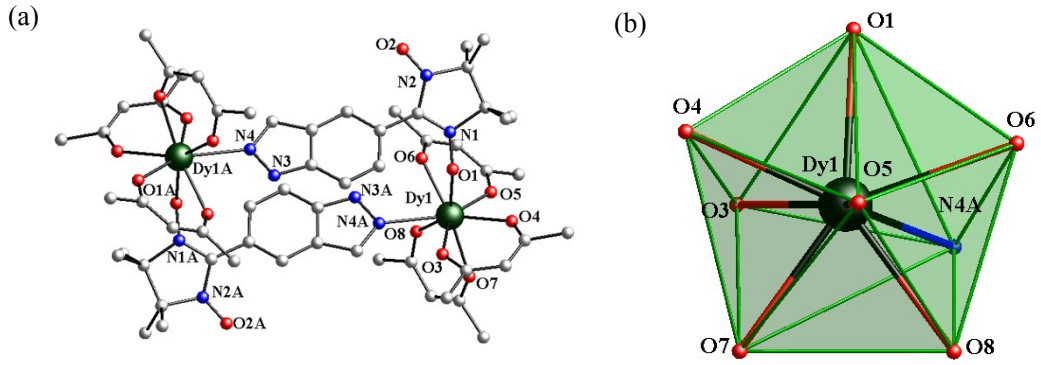

Figure S5. (a) Simplified view of the crystal structure of **2**. Fluorine and hydrogen atoms are omitted for clarity. (b) D_{2d}-symmetry polyhedral of gadolinium atom.

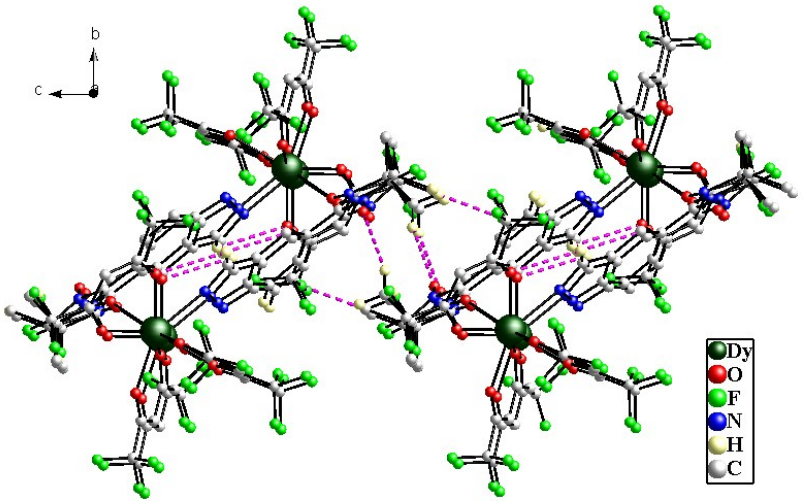

Figure S6. Viewing of the 3D packing structure of **2**.

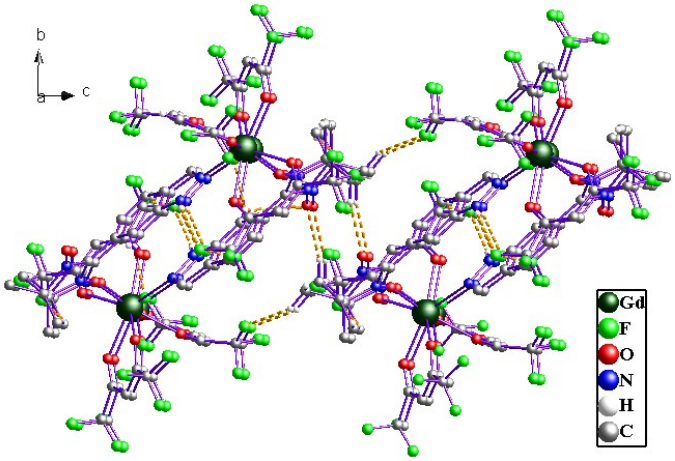

Figure S7. Viewing of the 3D packing structure of **3**.

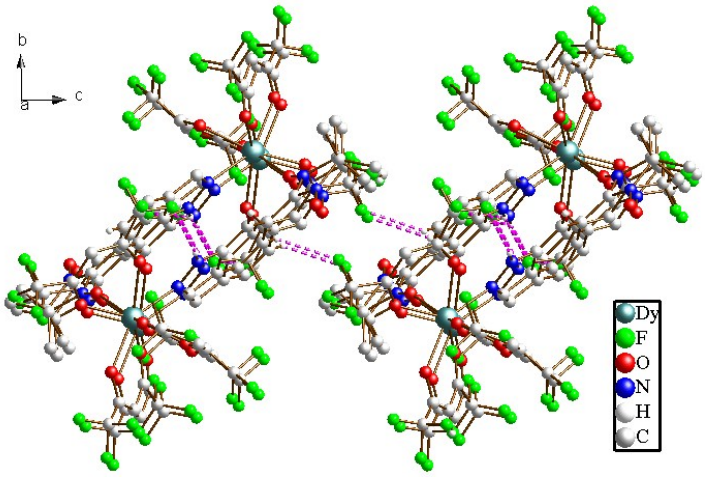

Figure S8. Viewing of the 3D packing structure of **4**.

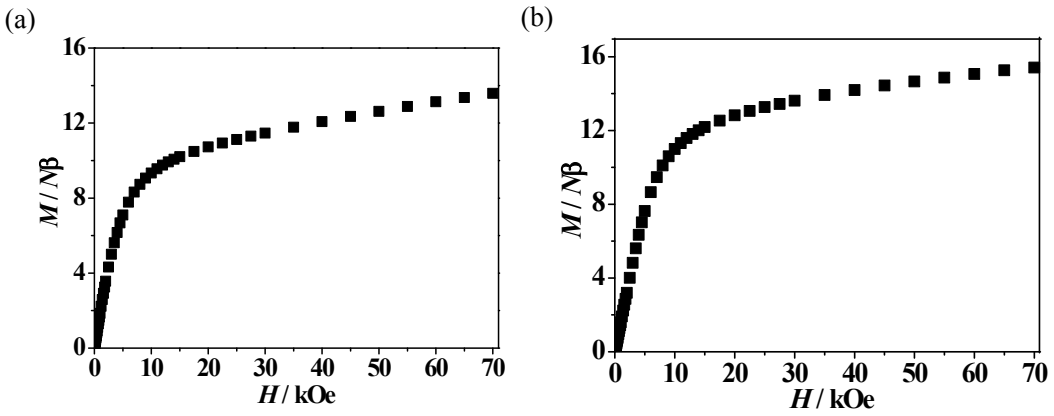

Figure S9. Field dependence of the magnetization at 2 K for complexes **2** (a) and **4** (b).

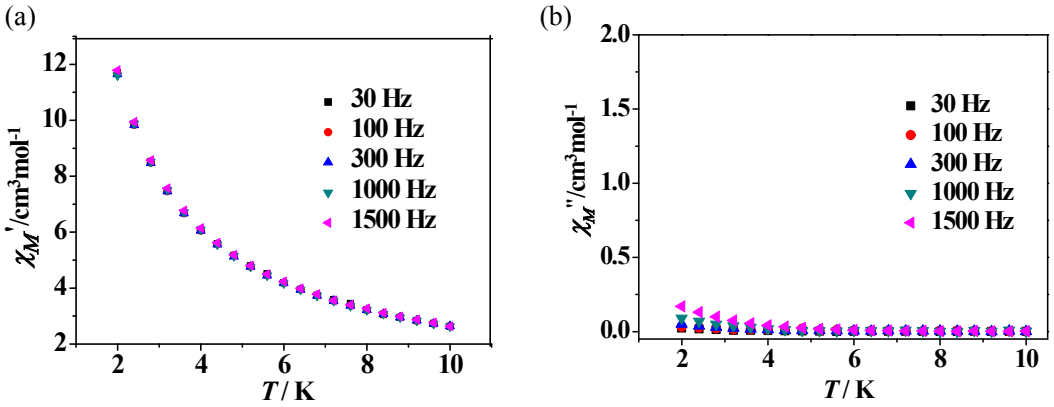

Figure S10. Temperature dependence of the in-phase (χ') (a) and out-of-phase (χ'') (b) components of the ac magnetic susceptibility for complex **2** under zero dc field

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

Gd(1)-O(1)	2.332(4)	O(3)-Gd(1)-N(4)#1	75.33(13)
Gd(1)-O(3)	2.417(4)	O(4)-Gd(1)-O(3)	71.90(12)
Gd(1)-O(4)	2.339(4)	O(4)-Gd(1)-O(5)	78.40(13)
Gd(1)-O(5)	2.397(4)	O(4)-Gd(1)-O(6)	86.60(14)
Gd(1)-O(6)	2.354(4)	O(4)-Gd(1)-O(7)	76.64(13)
Gd(1)-O(7)	2.369(4)	O(4)-Gd(1)-O(8)	147.71(13)
Gd(1)-O(8)	2.357(4)	O(4)-Gd(1)-N(4)#1	139.64(14)
Gd(1)-N(4)	2.546(4)	O(5)-Gd(1)-O(3)	71.60(13)
O(1)-Gd(1)-O(3)	72.44(13)	O(6)-Gd(1)-O(3)	139.61(14)
O(1)-Gd(1)-O(4)	102.97(13)	O(6)-Gd(1)-O(5)	70.79(13)
O(1)-Gd(1)-O(5)	141.50(13)	O(6)-Gd(1)-O(7)	77.25(13)
O(1)-Gd(1)-O(6)	147.28(13)	O(6)-Gd(1)-O(8)	75.32(14)
O(1)-Gd(1)-O(7)	74.79(13)	O(6)-Gd(1)-N(4)#1	71.78(14)
O(1)-Gd(1)-O(8)	80.67(13)	N(1)-O(1)-Gd(1)#1	139.9(3)
O(1)-Gd(1)-N(4)#1	88.71(14)	N(3)-N(4)-Gd(1)#1	117.0(3)

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

Dy(1)-O(1)	2.308(4)	O(3)-Dy(1)-O(4)	74.27(13)
Dy(1)-O(3)	2.318(4)	O(3)-Dy(1)-O(6)	137.21(13)
Dy(1)-O(4)	2.353(4)	O(3)-Dy(1)-O(7)	75.38(14)
Dy(1)-O(5)	2.317(4)	O(3)-Dy(1)-O(8)	119.02(14)
Dy(1)-O(6)	2.386(4)	O(3)-Dy(1)-N(4)#1	71.40(14)
Dy(1)-O(7)	2.328(4)	O(4)-Dy(1)-O(6)	126.40(13)
Dy(1)-O(8)	2.369(4)	O(4)-Dy(1)-O(8)	140.08(14)
Dy(1)-N(4)#1	2.520(5)	O(4)-Dy(1)-N(4)#1	143.94(14)
O(1)-Dy(1)-O(6)	72.60(13)	O(5)-Dy(1)-O(4)	75.69(14)
O(1)-Dy(1)-O(4)	74.51(13)	O(5)-Dy(1)-O(3)	147.41(14)
O(1)-Dy(1)-O(5)	103.71(14)	O(5)-Dy(1)-O(6)	72.56(13)
O(1)-Dy(1)-O(7)	146.67(14)	O(5)-Dy(1)-O(7)	86.02(14)
O(1)-Dy(1)-O(3)	80.10(14)	O(5)-Dy(1)-O(8)	78.15(14)
O(1)-Dy(1)-O(8)	141.64(13)	O(6)-Dy(1)-N(4)#1	75.72(14)

O(1)-Dy(1)-N(4)#1	88.95(14)	O(7)-Dy(1)-O(6)	140.07(14)

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Table S3. Selected bond lengths (Å) and bond angles (°) in complex **3**.

Gd(1)-O(1)	2.313(5)	O(3)-Gd(1)-N(4)#1	75.02(18)
Gd(1)-O(3)	2.389(5)	O(4)-Gd(1)-O(3)	71.9(2)
Gd(1)-O(4)	2.330(6)	O(4)-Gd(1)-O(5)	84.6(2)
Gd(1)-O(5)	2.343(5)	O(4)-Gd(1)-O(6)	77.9(2)
Gd(1)-O(6)	2.398(5)	O(4)-Gd(1)-O(7)	78.9(2)
Gd(1)-O(7)	2.371(5)	O(4)-Gd(1)-O(8)	144.6(2)
Gd(1)-O(8)	2.393(5)	O(4)-Gd(1)-N(4)#1	142.8(2)
Gd(1)-N(4)#1	2.558(6)	O(5)-Gd(1)-O(3)	75.89(19)
O(1)-Gd(1)-O(3)	77.10(18)	O(6)-Gd(1)-O(3)	136.2(2)
O(1)-Gd(1)-O(4)	106.7(2)	O(6)-Gd(1)-O(5)	70.25(19)
O(1)-Gd(1)-O(5)	145.60(18)	O(6)-Gd(1)-O(7)	72.85(19)
O(1)-Gd(1)-O(6)	143.19(19)	O(6)-Gd(1)-O(8)	72.9(2)
O(1)-Gd(1)-O(7)	72.41(19)	O(8)-Gd(1)-N(4)#1	70.59(18)
O(1)-Gd(1)-O(8)	85.97(18)	N(1)-O(1)-Gd(1)	150.6(4)
O(1)-Gd(1)-N(4)#1	81.81(18)	N(3)-N(4)-Gd(1)#1	123.2(4)

Table S4. Selected bond lengths (Å) and bond angles (°) in complex **4**.

Dy(1)-O(1)	2.284(4)	O(3)-Dy(1)-O(4)	74.55(18)
Dy(1)-O(3)	2.346(5)	O(3)-Dy(1)-O(6)	141.97(16)
Dy(1)-O(4)	2.346(5)	O(3)-Dy(1)-O(7)	77.8(2)
Dy(1)-O(5)	2.368(5)	O(3)-Dy(1)-O(8)	127.60(17)
Dy(1)-O(6)	2.312(5)	O(3)-Dy(1)-N(4)#1	137.99(18)
Dy(1)-O(7)	2.299(6)	O(4)-Dy(1)-O(6)	104.23(17)
Dy(1)-O(8)	2.364(5)	O(4)-Dy(1)-O(8)	143.68(16)
Dy(1)-N(4)#1	2.528(5)	O(4)-Dy(1)-N(4)#1	70.82(16)
O(1)-Dy(1)-O(6)	145.69(16)	O(5)-Dy(1)-O(4)	72.99(19)
O(1)-Dy(1)-O(4)	85.30(17)	O(5)-Dy(1)-O(3)	72.43(17)
O(1)-Dy(1)-O(5)	142.28(18)	O(5)-Dy(1)-O(6)	71.07(17)
O(1)-Dy(1)-O(7)	107.38(18)	O(5)-Dy(1)-O(7)	77.3(2)
O(1)-Dy(1)-O(3)	72.23(16)	O(5)-Dy(1)-O(8)	136.66(19)
O(1)-Dy(1)-O(8)	77.28(17)	O(6)-Dy(1)-N(4)#1	70.90(17)

O(1)-Dy(1)-N(4)#1	81.86(16)	O(7)-Dy(1)-O(6)	84.20(19)