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# Supporting Information

## $Ln^{III}$-$Co^{II}$ heterometallic chains based on pyridine substituted nitronyl nitroxides

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Table S1 Selected bond lengths [Å] and angles [°] for complexes **1** and **2**.

| **1** Y | | **2** Gd | |
|---|---|---|---|
| Y(1)-O(9) | 2.300(4) | Gd(1)-O(9) | 2.318(5) |
| Y(1)-O(4) | 2.319(4) | Gd(1)-O(4) | 2.393(6) |
| Y(1)-O(7) | 2.338(4) | Gd(1)-O(7) | 2.364(5) |
| Y(1)-O(2)#1 | 2.347(4) | Gd(1)-O(2) | 2.371(5) |
| Y(1)-O(6) | 2.341(4) | Gd(1)-O(6) | 2.371(5) |
| Y(1)-O(5) | 2.375(4) | Gd(1)-O(5) | 2.368(5) |
| Y(1)-O(8) | 2.369(4) | Gd(1)-O(8) | 2.381(6) |
| Y(1)-O(3) | 2.379(4) | Gd(1)-O(3) | 2.343(4) |
| Co(1)-O(12) | 2.100(4) | Co(1)-O(12) | 2.054(5) |
| Co(1)-O(11) | 2.074(4) | Co(1)-O(11) | 2.081(5) |
| Co(1)-O(13) | 2.071(4) | Co(1)-O(13) | 2.046(5) |
| Co(1)-O(14) | 2.060(4) | Co(1)-O(14) | 2.062(5) |
| Co(1)-N(1) | 2.166(5) | Co(1)-N(1)#1 | 2.132(5) |
| Co(1)-N(6) | 2.159(5) | Co(1)-N(6) | 2.171(5) |
| O(1)-N(2) | 1.280(7) | O(1)-N(2) | 1.263(7) |
| O(2)-N(3) | 1.308(6) | O(2)-N(3) | 1.298(7) |
| O(9)-N(4) | 1.296(6) | O(9)-N(4) | 1.287(7) |
| O(10)-N(5) | 1.292(6) | O(10)-N(5) | 1.273(6) |
| O(4)-Y(1)-O(3) | 72.65(15) | O(4)-Gd(1)-O(3) | 71.88(18) |
| O(6)-Y(1)-O(5) | 74.36(14) | O(6)-Gd(1)-O(5) | 73.83(18) |
| O(7)-Y(1)-O(8) | 71.87(15) | O(7)-Gd(1)-O(8) | 71.1(2) |
| O(9)-Y(1)-O(2)#1 | 137.04(15) | O(9)-Gd(1)-O(2) | 138.7(2) |
| O(12)-Co(1)-O(11) | 88.40(16) | O(12)-Co(1)-O(11) | 88.26(19) |
| O(13)-Co(1)-O(14) | 88.45(16) | O(13)-Co(1)-O(14) | 88.99(19) |
| N(1)-Co(1)-N(6) | 179.6(2) | N(1)#1-Co(1)-N(6) | 179.1(2) |
| N(4)-O(9)-Y(1) | 157.9(4) | N(4)-O(9)-Gd(1) | 160.2(5) |
| N(3)-O(2)-Y(1)#2 | 135.8(3) | N(3)-O(2)-Gd(1) | 138.4(5) |

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

Table S2 Selected bond lengths [Å] and angles [°] for complexes **3** and **4**.

| **3** Dy | | **4** Dy | |
|---|---|---|---|
| Dy(1)-O(9) | 2.312(5) | Dy(1)-O(9) | 2.336(7) |
| Dy(1)-O(4) | 2.381(7) | Dy(1)-O(4) | 2.365(7) |
| Dy(1)-O(7) | 2.342(6) | Dy(1)-O(7) | 2.391(6) |
| Dy(1)-O(2) | 2.342(6) | Dy(1)-O(2)#1 | 2.339(6) |
| Dy(1)-O(6) | 2.346(6) | Dy(1)-O(6) | 2.350(7) |
| Dy(1)-O(5) | 2.357(6) | Dy(1)-O(5) | 2.377(7) |
| Dy(1)-O(8) | 2.364(6) | Dy(1)-O(8) | 2.353(6) |
| Dy(1)-O(3) | 2.327(6) | Dy(1)-O(3) | 2.300(6) |
| Co(1)-O(12) | 2.041(6) | Co(1)-O(12) | 2.016(8) |
| Co(1)-O(11) | 2.082(5) | Co(1)-O(11) | 2.074(7) |
| Co(1)-O(13) | 2.051(6) | Co(1)-O(13) | 2.065(9) |
| Co(1)-O(14) | 2.061(5) | Co(1)-O(14) | 2.078(9) |
| Co(1)-N(1)#1 | 2.138(6) | Co(1)-N(1) | 2.093(9) |
| Co(1)-N(6) | 2.175(6) | Co(1)-N(6) | 2.151(8) |
| O(1)-N(2) | 1.250(9) | O(1)-N(2) | 1.280(10) |
| O(9)-N(4) | 1.281(8) | O(9)-N(4) | 1.300(9) |
| O(10)-N(5) | 1.284(8) | O(10)-N(5) | 1.274(10) |
| O(2)-N(3) | 1.329(9) | O(2)-N(3) | 1.311(9) |
| O(3)-Dy(1)-O(4) | 72.3(2) | O(3)-Dy(1)-O(4) | 73.8(2) |
| O(6)-Dy(1)-O(5) | 74.3(2) | O(6)-Dy(1)-O(5) | 73.2(2) |
| O(7)-Dy(1)-O(8) | 71.9(2) | O(8)-Dy(1)-O(7) | 72.2(2) |
| O(9)-Dy(1)-O(2) | 138.2(2) | O(9)-Dy(1)-O(2)#1 | 139.4(2) |
| O(12)-Co(1)-O(11) | 88.6(2) | O(12)-Co(1)-O(11) | 88.9(3) |
| O(13)-Co(1)-O(14) | 89.1(2) | O(13)-Co(1)-O(14) | 88.8(4) |
| N(1)#1-Co(1)-N(6) | 179.1(3) | N(1)-Co(1)-N(6) | 93.8(3) |
| N(4)-O(9)-Dy(1) | 160.0(5) | N(4)-O(9)-Dy(1) | 139.1(6) |
| N(3)-O(2)-Dy(1) | 137.7(6) | N(3)-O(2)-Dy(1)#2 | 136.3(5) |

Symmetry transformations used to generate equivalent atoms: #1 x + 1, y - 1, z; #2 x - 1, y + 1, z for **3**; #1 –x + 1, y + 1/2, -z - 1/2; #2 –x + 1, y - 1/2, -z - 1/2 for **4**

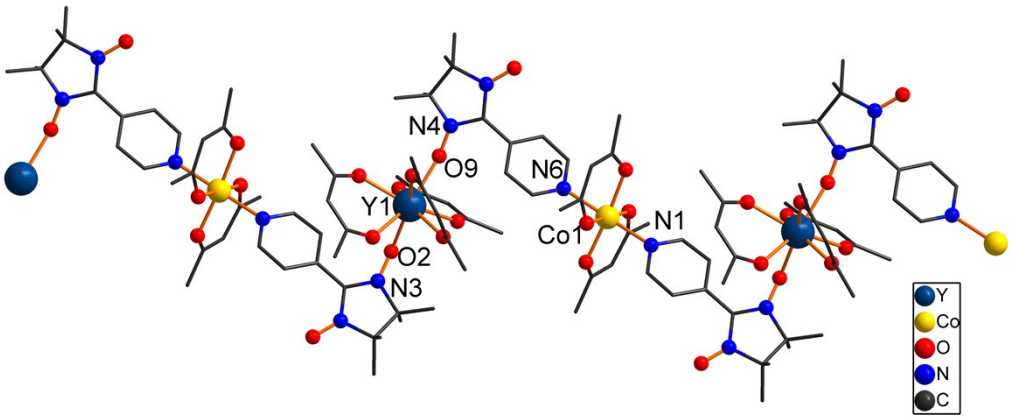


**Figure S1.** Crystal structure of complex **1** with the atom-labeling. All of the hydrogen and fluorine atoms and hexane solvent molecules are omitted for clarity.

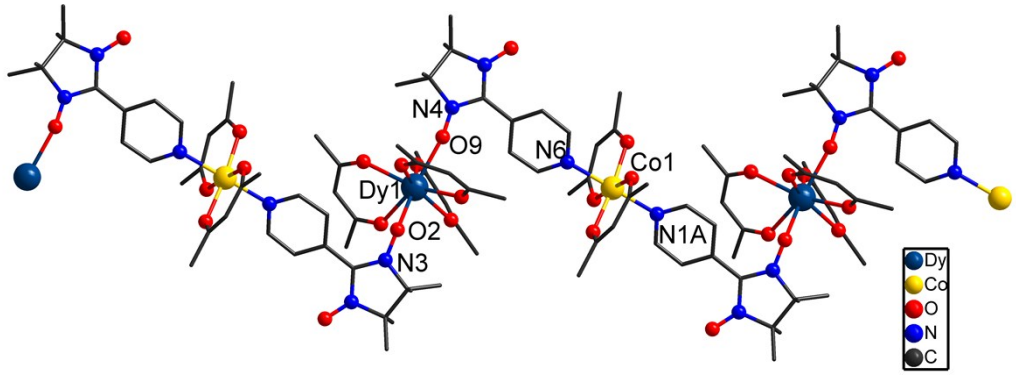


**Figure S2.** Crystal structure of complex **3** with the atom-labeling. All of the hydrogen and fluorine atoms and hexane solvent molecules are omitted for clarity.

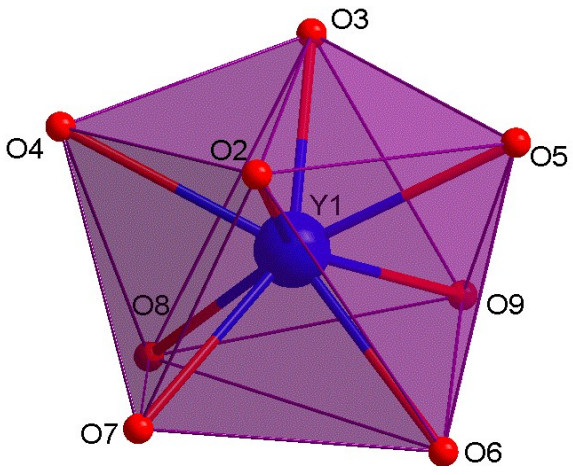


**Figure S3.** The coordination polyhedron of the Y ion in complex **1.**

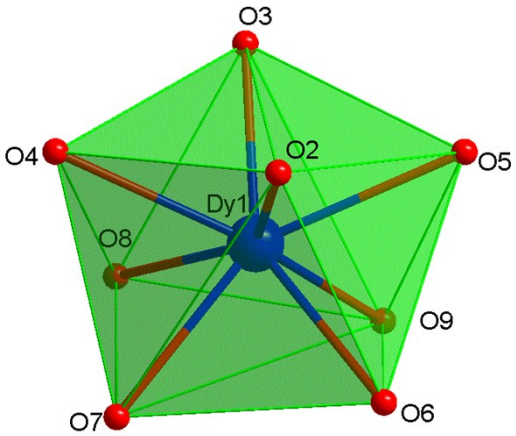


**Figure S4.** The coordination polyhedron of the Dy ion in complex **3.**

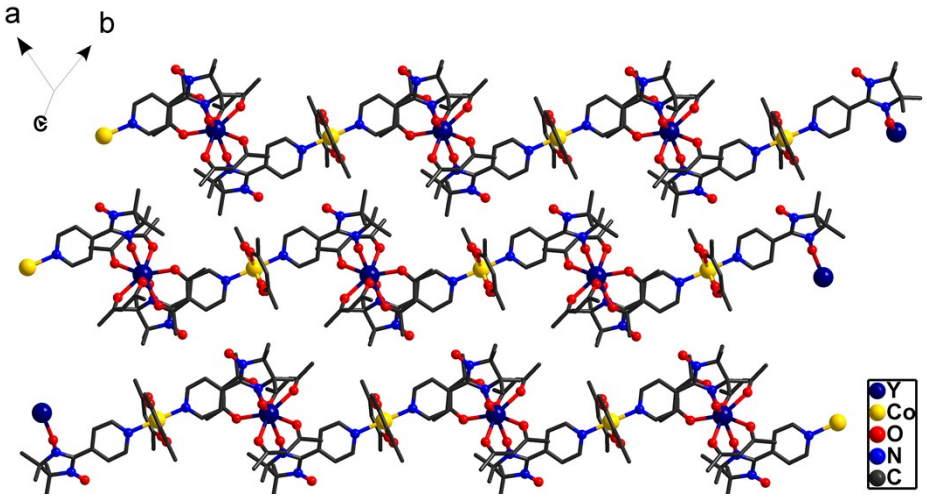


**Figure S5.** Packing of the chains in crystal for complex **1**. All of the hydrogen and fluorine atoms and hexane solvent molecules are omitted for clarity.

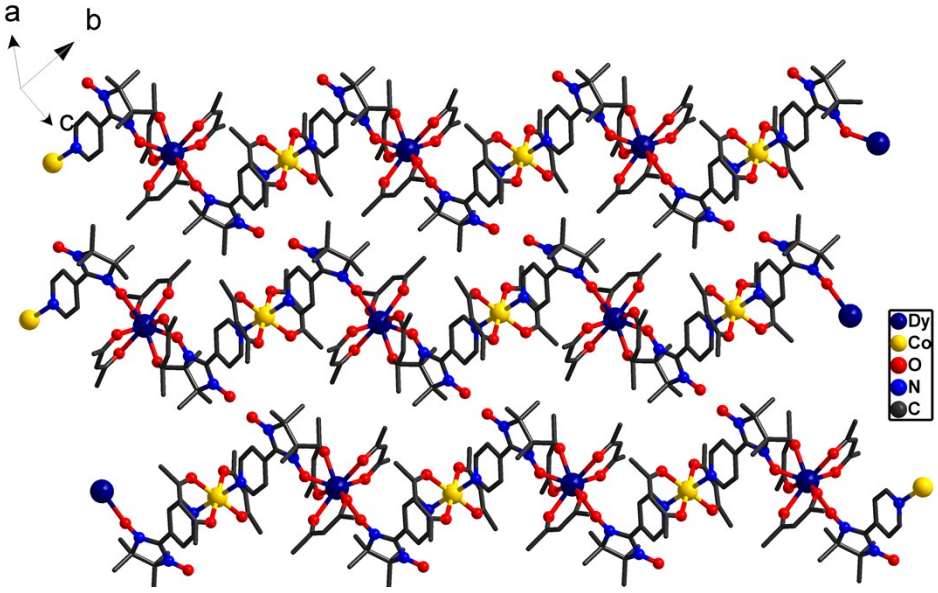


**Figure S6.** Packing of the chains in crystal for complex **3**. All of the hydrogen and fluorine atoms and hexane solvent molecules are omitted for clarity.

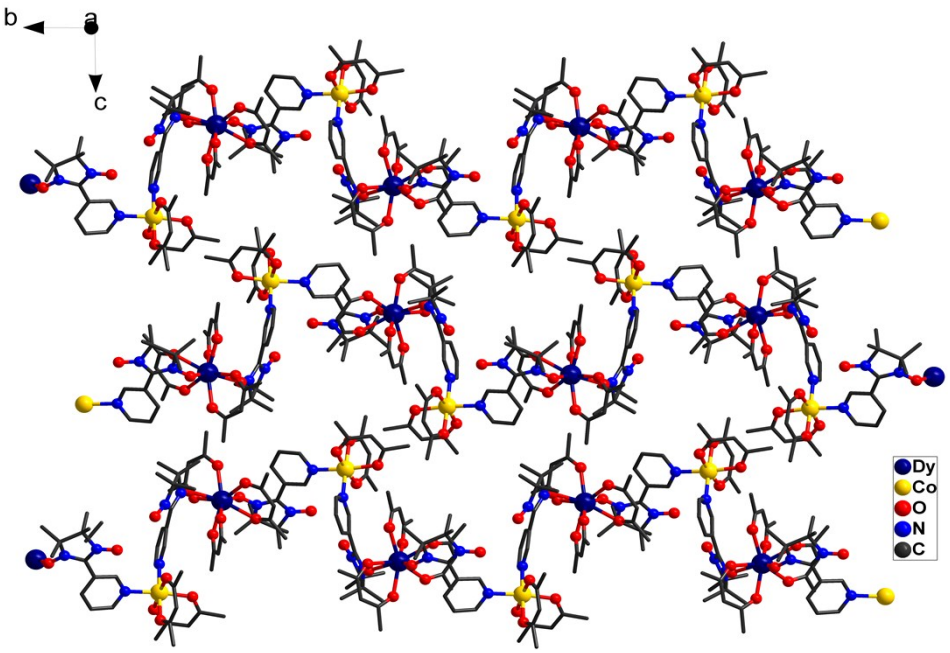


**Figure S7.** Packing of the chains in crystal for complex **4**. All of the hydrogen, fluorine atoms and solvent molecules are omitted for clarity.

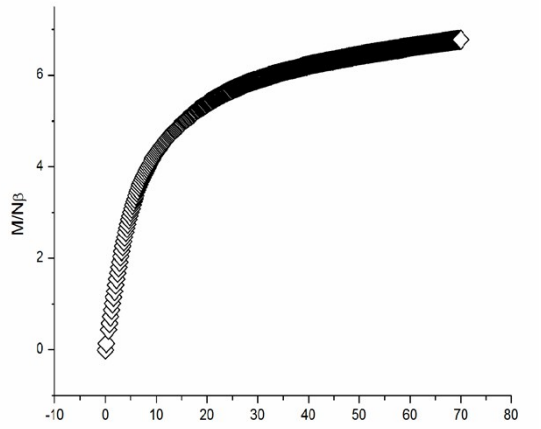


**Figure S8** *M* versus *H* plot of complex **3** at 2.0K.

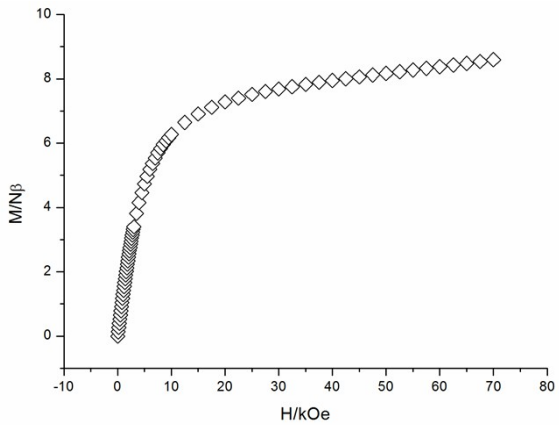


**Figure S9** *M* versus *H* plot of complex **4** at 2.0K.

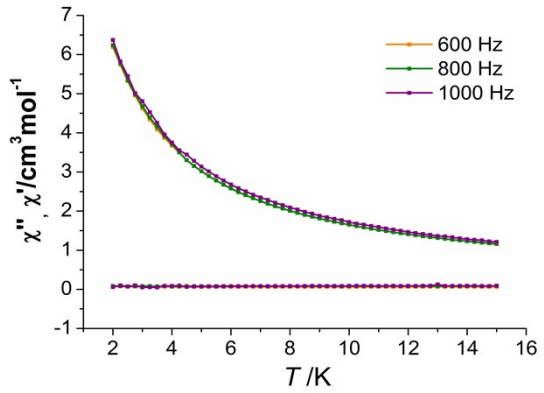


**Figure S10** Temperature dependence of the in-phase and out-of-phase components of the ac magnetic susceptibilities for **3** in zero dc field.

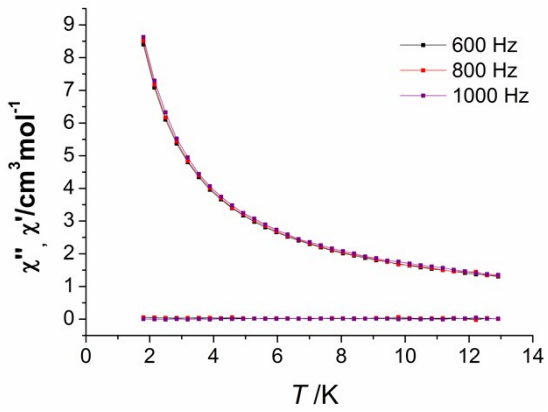


**Figure S11** Temperature dependence of the in-phase and out-of-phase components of the ac magnetic susceptibilities for **4** in zero dc field.

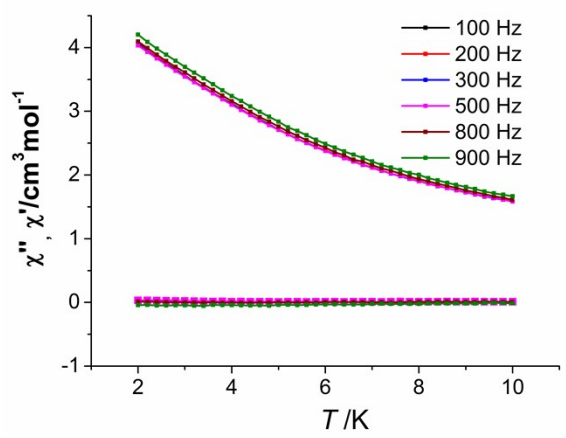


**Figure S12** Temperature dependence of the in-phase and out-of-phase components of the ac magnetic susceptibilities for **3** in 3 kOe dc field.

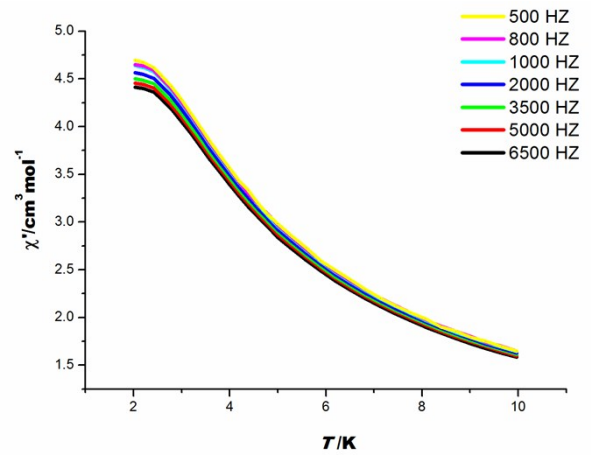


**Figure S13** Temperature dependence of the in-phase components of the ac magnetic susceptibilities for **4** in 2kOe dc field.

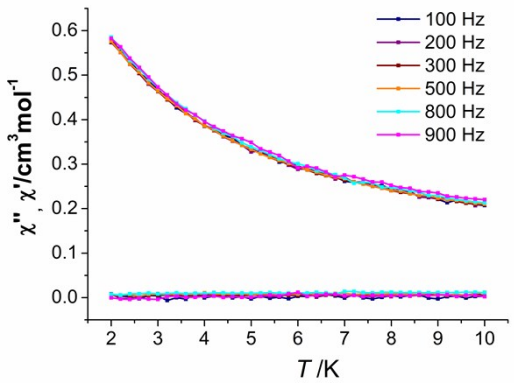


**Figure S14** Temperature dependence of the in-phase and out-of-phase components of the ac magnetic susceptibilities for **1** in 2 kOe dc field.