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**Supporting Information**

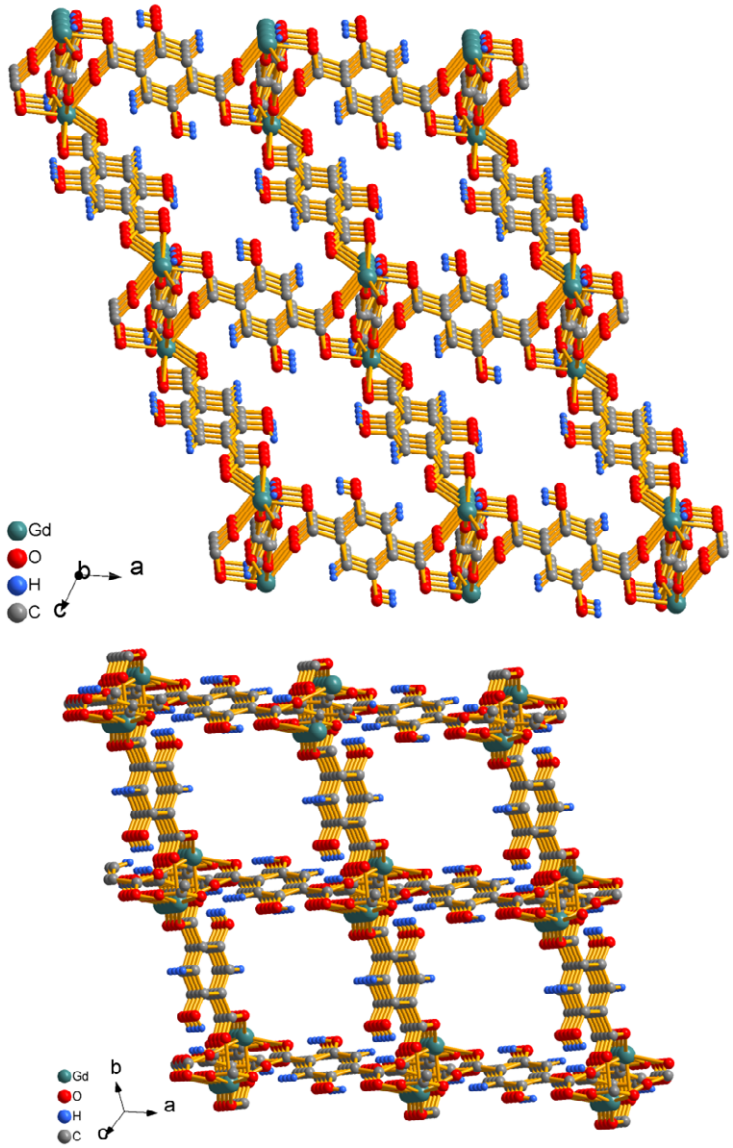


**Fig. S1** The three-dimensional framework of **4** showing the one-dimensional channels from different directions (The DMF molecules are omitted.)

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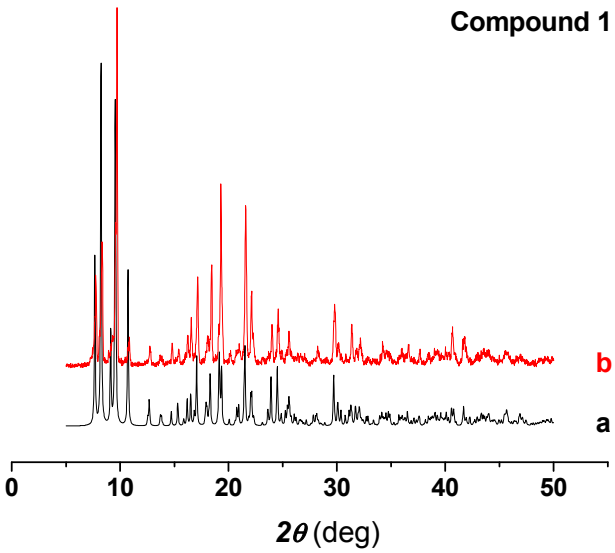


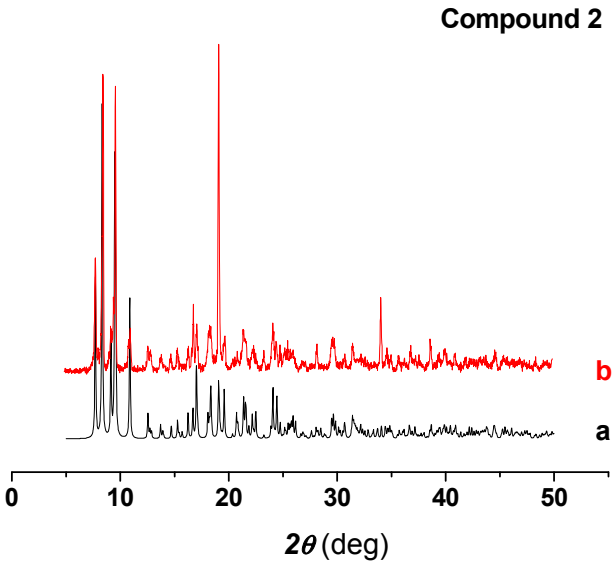

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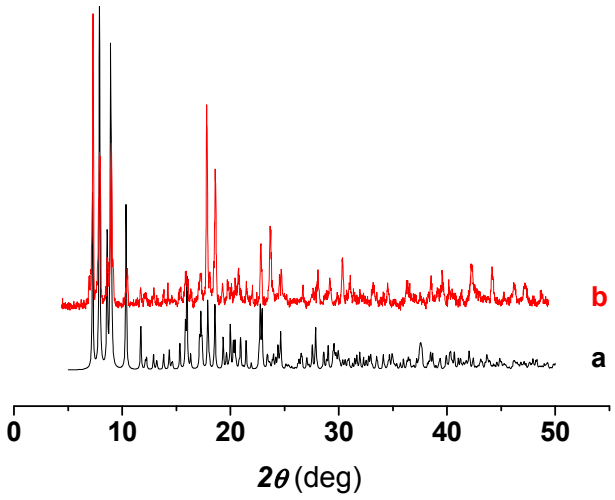
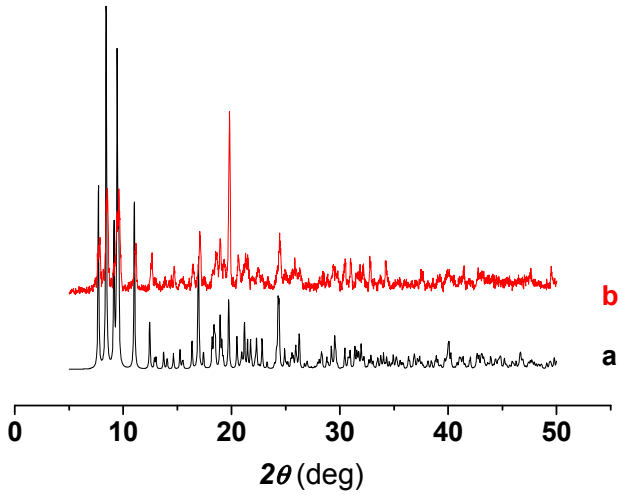
**Compound 3**




**Compound 4**



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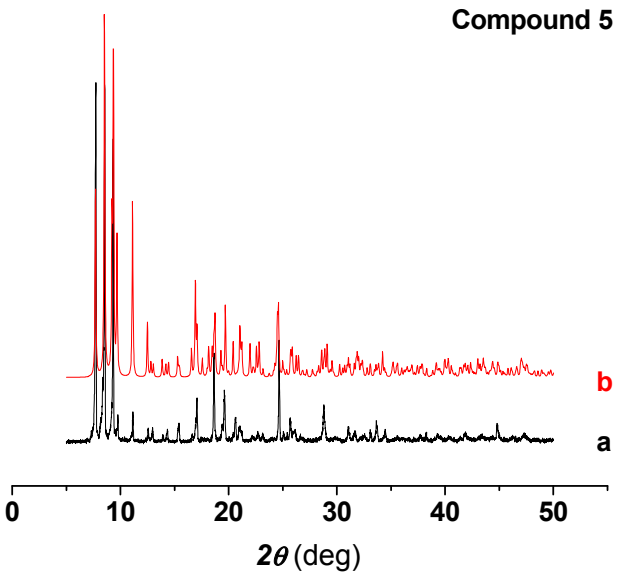


**Figure S2.** The PXRD patterns for compounds **1**–**5** (a) simulated pattern from single-crystal diffraction data and (b) as prepared

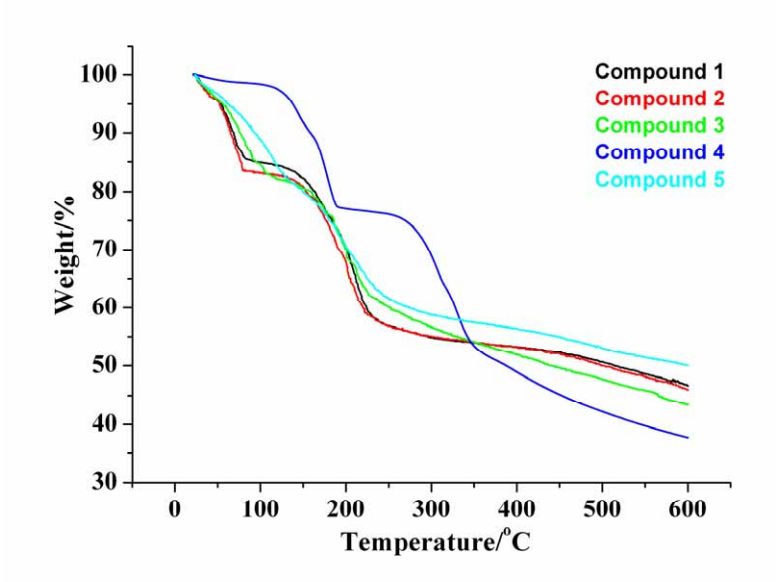


**Fig. S3** TGA curve of compounds **1**–**5**

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**Table S1** Selected Bond Lengths (Å) and Bond Angles (deg) of compounds **1** – **5** [a]

| | | | |
|---|---|---|---|
| Compound **1** | | | |
| La(1)−O(4) | 2.475(3) | La(1)−O(5A) | 2.537(3) |
| La(1)−O(1) | 2.468(3) | La(1)−O(10) | 2.519(3) |
| La(1)−O(11) | 2.512(3) | La(1)−O(7) | 2.605(3) |
| La(1)−O(8) | 2.576(3) | La(1)−O(4A) | 2.824(3) |
| La(1)−O(2A) | 2.515(3) | O(4)−La(1)−O(2A) | 75.14(10) |
| O(4)−La(1)−O(1) | 74.92(10) | O(4)−La(1)−O(5A) | 121.46(9) |
| O(1)−La(1)−O(2A) | 129.67(10) | O(2A)−La(1)−O(5A) | 78.16(11) |
| O(1)−La(1)−O(5A) | 84.24(11) | O(1)−La(1)−O(11) | 75.81(11) |
| O(4)−La(1)−O(11) | 145.52(11) | O(5A)−La(1)−O(11) | 72.77(12) |
| O(2A)−La(1)−O(11) | 138.85(11) | O(1)−La(1)−O(10) | 73.84(13) |
| O(4)−La(1)−O(10) | 81.82(12) | O(5A)−La(1)−O(10) | 142.74(13) |
| O(2A)−La(1)−O(10) | 138.81(12) | O(4)−La(1)−O(8) | 90.12(10) |
| O(11)−La(1)−O(10) | 72.84(13) | O(2A)−La(1)−O(8) | 75.95(11) |
| O(1)−La(1)−O(8) | 142.79(11) | O(11)−La(1)−O(8) | 102.54(12) |
| O(5A)−La(1)−O(8) | 131.54(11) | O(4)−La(1)−O(7) | 131.30(10) |
| O(10)−La(1)−O(8) | 70.36(13) | O(2A)−La(1)−O(7) | 69.07(11) |
| O(1)−La(1)−O(7) | 153.68(11) | O(11)−La(1)−O(7) | 78.62(11) |
| O(5A)−La(1)−O(7) | 82.35(10) | O(8)−La(1)−O(7) | 50.27(10) |
| O(10)−La(1)−O(7) | 104.41(13) | O(1)−La(1)−O(4A) | 66.24(9) |
| O(4)−La(1)−O(4A) | 73.79(9) | O(5A)−La(1)−O(4A) | 47.84(9) |
| O(2A)−La(1)−O(4A) | 67.04(9) | O(10)−La(1)−O(4A) | 137.24(12) |
| O(11)−La(1)−O(4A) | 110.02(11) | O(7)−La(1)−O(4A) | 118.13(9) |
| O(8)−La(1)−O(4A) | 142.23(10) | La(1)−O(4)−La(1A) | 106.21(9) |
| Compound **2** | | | |
| Nd(1)−O(4) | 2.408(2) | Nd(1)−O(5A) | 2.470(2) |
| Nd(1)−O(1) | 2.416(2) | Nd(1)−O(10) | 2.468(3) |
| Nd(1)−O(11) | 2.465(3) | Nd(1)−O(7) | 2.578(2) |
| Nd(1)−O(8) | 2.494(2) | Nd(1)−O(4A) | 2.847(2) |
| Nd(1)−O(2A) | 2.455(2) | O(4)−Nd(1)−O(2A) | 75.56(8) |
| O(4)−Nd(1)−O(1) | 76.18(8) | O(4)−Nd(1)−O(5A) | 122.21(8) |
| O(1)−Nd(1)−O(2A) | 129.11(8) | O(2A)−Nd(1)−O(5A) | 78.16(9) |
| O(1)−Nd(1)−O(5A) | 82.42(9) | O(1)−Nd(1)−O(11) | 76.06(9) |
| O(4)−Nd(1)−O(11) | 145.57(9) | O(5A)−Nd(1)−O(11) | 73.36(10) |
| O(2A)−Nd(1)−O(11) | 138.63(9) | O(1)−Nd(1)−O(10) | 74.15(11) |
| O(4)−Nd(1)−O(10) | 80.35(10) | O(5A)−Nd(1)−O(10) | 142.46(11) |
| O(2A)−Nd(1)−O(10) | 139.25(11) | O(4)−Nd(1)−O(8) | 89.07(9) |
| O(11)−Nd(1)−O(10) | 72.79(11) | O(2A)−Nd(1)−O(8) | 76.34(9) |
| O(1)−Nd(1)−O(8) | 143.81(9) | O(11)−Nd(1)−O(8) | 101.69(10) |
| O(5A)−Nd(1)−O(8) | 132.31(9) | O(4)−Nd(1)−O(7) | 131.51(8) |
| O(10)−Nd(1)−O(8) | 70.85(11) | O(2A)−Nd(1)−O(7) | 69.22(9) |
| O(1)−Nd(1)−O(7) | 152.28(9) | O(11)−Nd(1)−O(7) | 77.56(9) |
| O(5A)−Nd(1)−O(7) | 82.04(8) | O(8)−Nd(1)−O(7) | 51.35(8) |
| O(10)−Nd(1)−O(7) | 105.85(11) | O(1)−Nd(1)−O(4A) | 65.55(8) |
| O(4)−Nd(1)−O(4A) | 74.30(8) | O(5A)−Nd(1)−O(4A) | 48.02(7) |
| O(2A)−Nd(1)−O(4A) | 66.49(7) | O(10)−Nd(1)−O(4A) | 136.23(10) |
| O(11)−Nd(1)−O(4A) | 111.42(9) | O(7)−Nd(1)−O(4A) | 117.72(8) |
| O(8)−Nd(1)−O(4A) | 141.91(9) | Nd(1)−O(4)−Nd(1A) | 105.70(8) |
| Compound **3** | | | |
| Sm(1)−O(4) | 2.367(3) | Sm(1)−O(5A) | 2.426(3) |
| Sm(1)−O(1) | 2.378(2) | Sm(1)−O(10) | 2.436(4) |
| Sm(1)−O(11) | 2.437(3) | Sm(1)−O(7) | 2.569(3) |
| Sm(1)−O(8) | 2.444(3) | Sm(1)−O(4A) | 2.893(3) |
| Sm(1)−O(2A) | 2.418(3) | O(4)−Sm(1)−O(2A) | 75.84(10) |
| O(4)−Sm(1)−O(1) | 76.64(9) | O(4)−Sm(1)−O(5A) | 122.45(10) |
| O(1)−Sm(1)−O(2A) | 128.05(9) | O(2A)−Sm(1)−O(5A) | 77.83(11) |
| O(1)−Sm(1)−O(5A) | 81.14(11) | O(1)−Sm(1)−O(11) | 76.70(10) |
| O(4)−Sm(1)−O(11) | 145.58(11) | O(5A)−Sm(1)−O(11) | 73.92(11) |
| O(2A)−Sm(1)−O(11) | 138.44(11) | O(1)−Sm(1)−O(10) | 74.23(13) |
| O(4)−Sm(1)−O(10) | 79.71(12) | O(5A)−Sm(1)−O(10) | 141.86(13) |
| O(2A)−Sm(1)−O(10) | 140.28(13) | O(4)−Sm(1)−O(8) | 88.00(10) |
| O(11)−Sm(1)−O(10) | 72.38(13) | O(2A)−Sm(1)−O(8) | 76.83(12) |
| O(1)−Sm(1)−O(8) | 144.37(11) | O(11)−Sm(1)−O(8) | 101.45(12) |
| O(5A)−Sm(1)−O(8) | 133.25(11) | O(4)−Sm(1)−O(7) | 131.25(9) |
| O(10)−Sm(1)−O(8) | 71.46(14) | O(2A)−Sm(1)−O(7) | 69.54(9) |
| O(1)−Sm(1)−O(7) | 152.09(9) | O(11)−Sm(1)−O(7) | 77.07(10) |
| O(5A)−Sm(1)−O(7) | 82.61(10) | O(8)−Sm(1)−O(7) | 51.82(10) |
| O(10)−Sm(1)−O(7) | 106.46(13) | O(1)−Sm(1)−O(4A) | 64.88(9) |
| O(4)−Sm(1)−O(4A) | 74.85(9) | O(5A)−Sm(1)−O(4A) | 47.69(8) |
| O(2A)−Sm(1)−O(4A) | 65.81(9) | O(10)−Sm(1)−O(4A) | 135.58(12) |
| O(11)−Sm(1)−O(4A) | 112.19(10) | O(7)−Sm(1)−O(4A) | 117.73(9) |
| O(8)−Sm(1)−O(4A) | 141.57(11) | Sm(1)−O(4)−Sm(1A) | 105.15(9) |

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| Compound **4** | | | |
|---|---|---|---|
| Gd(1)−O(4) | 2.328(3) | Gd(1)−O(5A) | 2.399(3) |
| Gd(1)−O(1) | 2.356(3) | Gd(1)−O(10) | 2.418(4) |
| Gd(1)−O(11) | 2.405(3) | Gd(1)−O(7) | 2.548(3) |
| Gd(1)−O(8) | 2.421(3) | Gd(1)−O(4A) | 2.939(3) |
| Gd(1)−O(2A) | 2.397(3) | O(4)−Gd(1)−O(2A) | 76.19(11) |
| O(4)−Gd(1)−O(1) | 76.84(11) | O(4)−Gd(1)−O(5A) | 122.28(11) |
| O(1)−Gd(1)−O(2A) | 127.28(11) | O(2A)−Gd(1)−O(5A) | 77.16(12) |
| O(1)−Gd(1)−O(5A) | 80.38(12) | O(1)−Gd(1)−O(11) | 77.06(12) |
| O(4)−Gd(1)−O(11) | 145.64(13) | O(5A)−Gd(1)−O(11) | 74.33(13) |
| O(2A)−Gd(1)−O(11) | 138.04(12) | O(1)−Gd(1)−O(10) | 74.86(14) |
| O(4)−Gd(1)−O(10) | 79.65(14) | O(5A)−Gd(1)−O(10) | 141.90(14) |
| O(2A)−Gd(1)−O(10) | 140.91(14) | O(4)−Gd(1)−O(8) | 87.05(12) |
| O(11)−Gd(1)−O(10) | 72.23(15) | O(2A)−Gd(1)−O(8) | 76.81(13) |
| O(1)−Gd(1)−O(8) | 144.91(12) | O(11)−Gd(1)−O(8) | 102.03(14) |
| O(5A)−Gd(1)−O(8) | 133.81(12) | O(4)−Gd(1)−O(7) | 131.28(10) |
| O(10)−Gd(1)−O(8) | 71.66(15) | O(2A)−Gd(1)−O(7) | 69.86(11) |
| O(1)−Gd(1)−O(7) | 151.87(11) | O(11)−Gd(1)−O(7) | 76.65(12) |
| O(5A)−Gd(1)−O(7) | 83.05(11) | O(8)−Gd(1)−O(7) | 52.26(11) |
| O(10)−Gd(1)−O(7) | 106.15(15) | O(1)−Gd(1)−O(4A) | 64.36(10) |
| O(4)−Gd(1)−O(4A) | 75.05(10) | O(5A)−Gd(1)−O(4A) | 47.31(10) |
| O(2A)−Gd(1)−O(4A) | 65.31(10) | O(10)−Gd(1)−O(4A) | 135.68(14) |
| O(11)−Gd(1)−O(4A) | 112.46(11) | O(7)−Gd(1)−O(4A) | 117.93(10) |
| O(8)−Gd(1)−O(4A) | 140.84(12) | Gd(1)−O(4)−Gd(1A) | 104.95(10) |
| Compound **5** | | | |
| Er(1)−O(4) | 2.261(3) | Er(1)−O(5A) | 2.338(3) |
| Er(1)−O(1) | 2.302(3) | Er(1)−O(10) | 2.356(4) |
| Er(1)−O(11) | 2.350(4) | Er(1)−O(7) | 2.505(3) |
| Er(1)−O(8) | 2.368(4) | O(10)−Er(1)−O(7) | 106.53(16) |
| Er(1)−O(2A) | 2.342(3) | O(4)−Er(1)−O(2A) | 76.46(12) |
| O(4)−Er(1)−O(1) | 77.38(12) | O(4)−Er(1)−O(5A) | 121.51(12) |
| O(1)−Er(1)−O(2A) | 124.55(11) | O(2A)−Er(1)−O(5A) | 75.25(12) |
| O(1)−Er(1)−O(5A) | 78.39(12) | O(1)−Er(1)−O(11) | 78.24(12) |
| O(4)−Er(1)−O(11) | 146.20(14) | O(5A)−Er(1)−O(11) | 75.34(14) |
| O(2A)−Er(1)−O(11) | 137.19(13) | O(1)−Er(1)−O(10) | 75.95(16) |
| O(4)−Er(1)−O(10) | 79.51(15) | O(5A)−Er(1)−O(10) | 141.82(16) |
| O(2A)−Er(1)−O(10) | 142.92(16) | O(4)−Er(1)−O(8) | 85.09(13) |
| O(11)−Er(1)−O(10) | 72.10(16) | O(2A)−Er(1)−O(8) | 77.58(13) |
| O(1)−Er(1)−O(8) | 146.22(13) | O(11)−Er(1)−O(8) | 103.04(14) |
| O(5A)−Er(1)−O(8) | 135.08(13) | O(4)−Er(1)−O(7) | 130.93(12) |
| O(10)−Er(1)−O(8) | 72.57(17) | O(2A)−Er(1)−O(7) | 70.64(12) |
| O(1)−Er(1)−O(7) | 151.69(12) | O(11)−Er(1)−O(7) | 75.95(12) |
| O(5A)−Er(1)−O(7) | 83.98(12) | O(8)−Er(1)−O(7) | 53.29(12) |

[a] Symmetry transformation for equivalent atoms: A: $-x, -y+1, -z+1$.