# Supporting Information

# Highly-connected, porous coordination polymers based on $[M_4(\mu_3\text{-}OH)_2]$ ($M = Co^{II}$ and $Ni^{II}$) clusters: different networks, adsorption and magnetic properties

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**Table S1**. Selected bond lengths (Å) and angles (°) for **1** and **2**.

| **1** | | | | | |
|---|---|---|---|---|---|
| Co1-O7 | 2.046(3) | Co1-O2 | 2.057(3) | Co1-O9*a* | 2.064(3) |
| Co1-O1 | 2.104(3) | Co1-N1*b* | 2.143(4) | Co1-O5 | 2.147(3) |
| Co2-O1 | 2.055(3) | Co2-O10*a* | 2.096(3) | Co2-N3*c* | 2.113(3) |
| Co2-O2 | 2.120(3) | Co2-O3 | 2.204(3) | Co3-O1 | 2.026(3) |
| Co3-O8 | 2.051(3) | Co3-O4 | 2.074(3) | Co3-N5 | 2.118(4) |
| Co3-O14 | 2.117(3)- | Co3-O5 | 2.220(3) | Co4-O2 | 2.045(3) |
| Co4-O13 | 2.095(3) | Co4-O6 | 2.112(3) | Co4-N4d | 2.166(4) |
| Co4-O3 | 2.214(3) | O7-Co1-O2 | 175.75(1) | O7-Co1-O9a | 89.09(1) |
| O2-Co1-O9a | 94.20(1) | O7-Co1-O1 | 91.77(1) | O2-Co1-O1 | 85.51(1) |
| O9a-Co1-O1 | 90.44(1) | O7-Co1-N1b | 86.50(1) | O2-Co1-N1b | 96.40(1) |

| | | | | | |
|---|---|---|---|---|---|
| O9a-Co1-N1b | 86.17(1) | O1-Co1-N1b | 176.22(1) | O7-Co1-O5 | 88.54(1) |
| O2-Co1-O5 | 87.81(1) | O9a-Co1-O5 | 171.16(1) | O1-Co1-O5 | 81.13(1) |
| N1b-Co1-O5 | 102.18(1) | O11-Co2-O1 | 177.44(1) | O11-Co2-O10a | 86.90(1) |
| O1-Co2-O10a | 91.89(1) | O11-Co2-N3c | 89.32(1) | O1-Co2-N3c | 92.96(1) |
| O11-Co2-O2 | 92.73(1) | O1-Co2-O2 | 85.14(1) | O10a-Co2-O2 | 95.43(1) |
| N3c-Co2-O2 | 173.24(1) | O11-Co2-O3 | 88.39(1) | O1-Co2-O3 | 92.70(1) |
| O10a-Co2-O3 | 174.51(1) | N3c-Co2-O3 | 91.68(1) | O2-Co2-O3 | 81.95(1) |
| O1-Co3-O8 | 94.21(1) | O1-Co3-O4 | 92.60(1) | O8-Co3-O4 | 171.93(1) |
| O1-Co3-N5 | 171.83(1) | O8-Co3-N5 | 87.24(1) | O4-Co3-N5 | 86.62(1) |
| O1-Co3-O14 | 96.09(1) | O8-Co3-O14 | 86.59(1) | O4-Co3-O14 | 88.40(1) |
| N5-Co3-O14 | 92.02(1) | O1-Co3-O5 | 81.11(1) | O8-Co3-O5 | 88.59(1) |
| O4-Co3-O5 | 96.73(1) | N5-Co3-O5 | 90.90(1) | O2-Co4-O13 | 94.23(1) |
| O2-Co4-O12 | 89.51(1) | O13-Co4-O12 | 87.57(1) | O2-Co4-O6 | 94.92(1) |
| O13-Co4-O6 | 86.67(1) | O12-Co4-O6 | 172.98(1) | O2-Co4-N4d | 171.39(1) |
| O13-Co4-N4d | 94.24(1) | O12-Co4-N4d | 89.32(1) | O6-Co4-N4d | 87.11(1) |
| O2-Co4-O3 | 83.39(1) | O13-Co4-O3 | 174.36(1) | O12-Co4-O3 | 87.30(1) |
| O6-Co4-O3 | 98.61(1) | N4d-Co4-O3 | 88.04(1) | | |

Symmetry codes: *a*) x+1/2, -y+1/2, z+1/2; *b*) -x+5/2, y-1/2, -z+1/2; *c*) -x+3/2, y+1/2, -z+1/2; *d*) -x+2, -y+1, -z.

**2**

| | | | | | |
|---|---|---|---|---|---|
| Ni1-O2 | 2.039(3) | Ni1-O7*a* | 2.042(2) | Ni1-O1 | 2.046(3) |
| Ni1-O9*b* | 2.057(2) | Ni1-N2 | 2.099(3) | Ni1-O5 | 2.114(2) |
| Ni2-O1 | 2.047(3) | Ni2-O2 | 2.050(3) | Ni2-N1 | 2.076(3) |
| Ni2-O8*a* | 2.081(2) | Ni2-O12*c* | 2.086(3) | Ni2-O3 | 2.145(2) |
| Ni3-O10*b* | 2.033(2) | Ni3-O1 | 2.036(3) | Ni3-O4 | 2.057(3) |
| Ni3-N5 | 2.08(2) | Ni3-N4 | 2.120(3) | Ni3-O5 | 2.155(3) |
| Ni4-O14*d* | 2.006(9) | Ni4-O11*c* | 2.015(3) | Ni4-O2 | 2.022(3) |
| Ni4-O6 | 2.025(3) | Ni4-N3*e* | 2.128(3) | Ni4-O3 | 2.240(3) |
| O10*b*-Ni3-O1 | 95.91(1) | O10*b*-Ni3-O4 | 171.52(1) | O1-Ni3-O4 | 91.36(1) |
| O10*b*-Ni3-N5 | 83.0(7) | O1-Ni3-N5 | 94.8(6) | O4-Ni3-N5 | 92.0(6) |
| O10*b*-Ni3-N4 | 86.93(1) | O1-Ni3-N4 | 172.53(1) | O4-Ni3-N4 | 86.39(1) |
| N5-Ni3-N4 | 92.4(6) | O10*b*-Ni3-O5 | 86.25(1) | O1-Ni3-O5 | 81.00(1) |
| O4-Ni3-O5 | 99.24(1) | N5-Ni3-O5 | 168.0(5) | N4-Ni3-O5 | 92.31(1) |
| O14*d*-Ni4-O11*c* | 90.6(2) | O14*d*-Ni4-O2 | 99.4(3) | O11*c*-Ni4-O2 | 92.56(1) |
| O14*d*-Ni4-O6 | 87.8(2) | O11*c*-Ni4-O6 | 172.36(1) | O2-Ni4-O6 | 95.07(1) |
| O14d-Ni4-N3e | 86.7(3) | O11c-Ni4-N3e | 86.49(1) | O2-Ni4-N3e | 173.89(1) |
| O6-Ni4-N3e | 85.97(1) | O14d-Ni4-O3 | 172.9(2) | O11c-Ni4-O3 | 82.39(1) |

| | | | | | |
|---|---|---|---|---|---|
| O2-Ni4-O3 | 79.86(1) | O6-Ni4-O3 | 99.36(1) | N3e-Ni4-O3 | 94.04(1) |
| O2-Ni1-O7a | 90.18(1) | O2-Ni1-O1 | 85.04(1) | O7a-Ni1-O1 | 93.89(1) |
| O2-Ni1-O9b | 175.68(1) | O7a-Ni1-O9 | 87.66(1) | O1-Ni1-O9b | 91.37(1) |
| O2-Ni1-N2 | 96.00(1) | O7a-Ni1-N2 | 85.92(1) | O1-Ni1-N2 | 178.94(1) |
| O9b-Ni1-N2 | 87.58(1) | O2-Ni1-O5 | 90.32(1) | O7a-Ni1-O5 | 175.58(1) |
| O1-Ni1-O5 | 81.78(1) | O9b-Ni1-O5 | 91.55(1) | N2-Ni1-O5 | 98.40(1) |
| O1-Ni2-O2- | 84.74(1) | O1-Ni2-N1 | 95.27(1) | O2-Ni2-N1 | 177.74(1) |
| O1-Ni2-O8a | 94.54(1) | O2-Ni2-O8a | 92.67(1) | O2-Ni2-O3 | 81.55(1) |
| O1-Ni2-O12c | 177.90(1) | O2-Ni2-O12c | 93.41(1) | O12c-Ni2-O3 | 88.08(1) |
| O8a-Ni2-O12c | 86.55(1) | O1-Ni2-O3 | 90.65(1) | O8a-Ni2-O3 | 171.86(1) |
| N1-Ni2-O3 | 96.19(1) | | | | |

Symmetry codes: *a*) x+1/2, -y+1/2, z+1/2; *b*) -x+1/2, y+1/2, -z+1/2; *c*) -x+3/2, y-1/2, -z+1/2; *d*) x+1, y, z; *e*) -x+1, -y, -z.

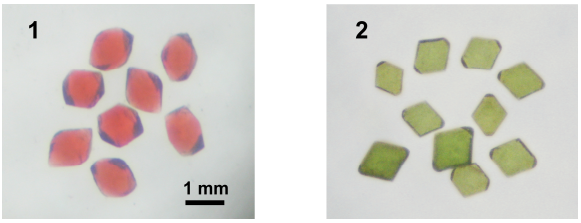



**Fig. S1.** Photos of chosen single crystals of **1** and **2.**

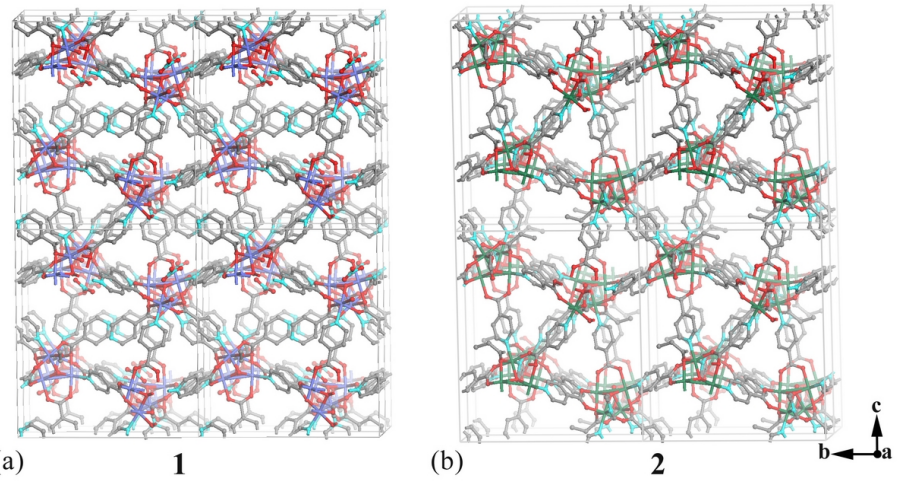
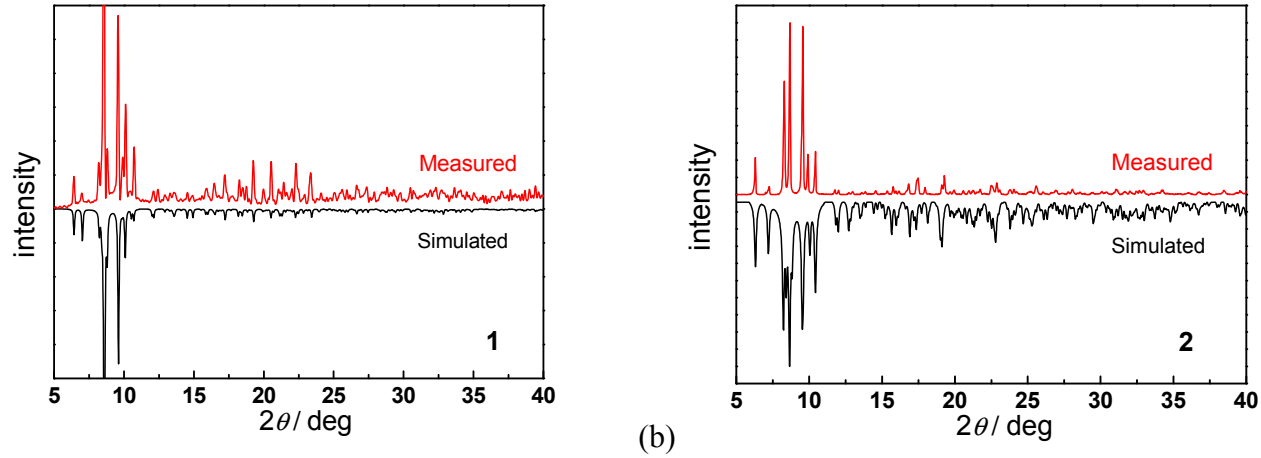
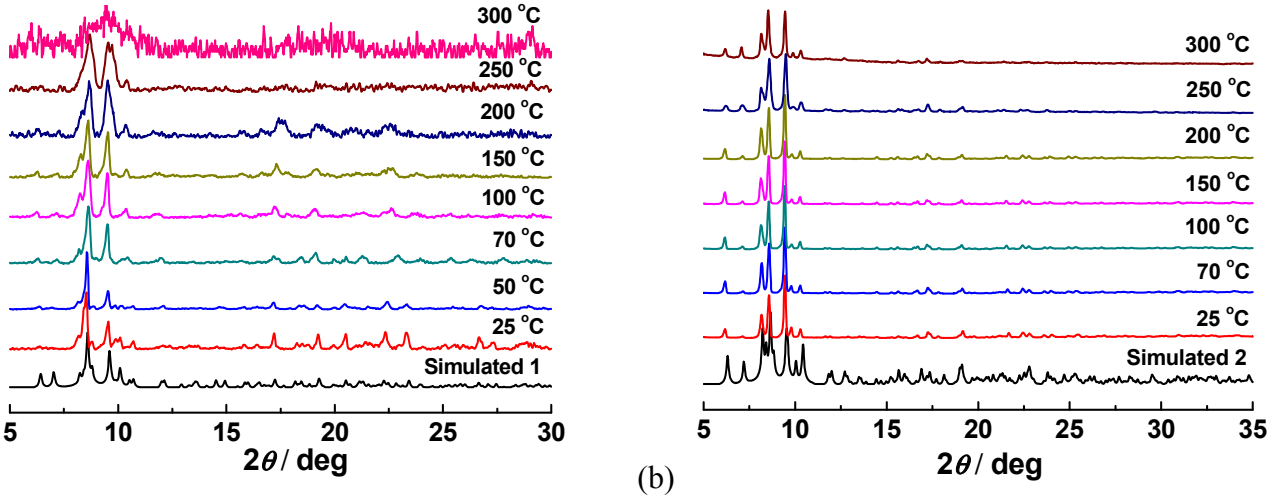



**Fig. S2.** Views of the 3D molecular packing patterns of **1** (a) and **2** (b).



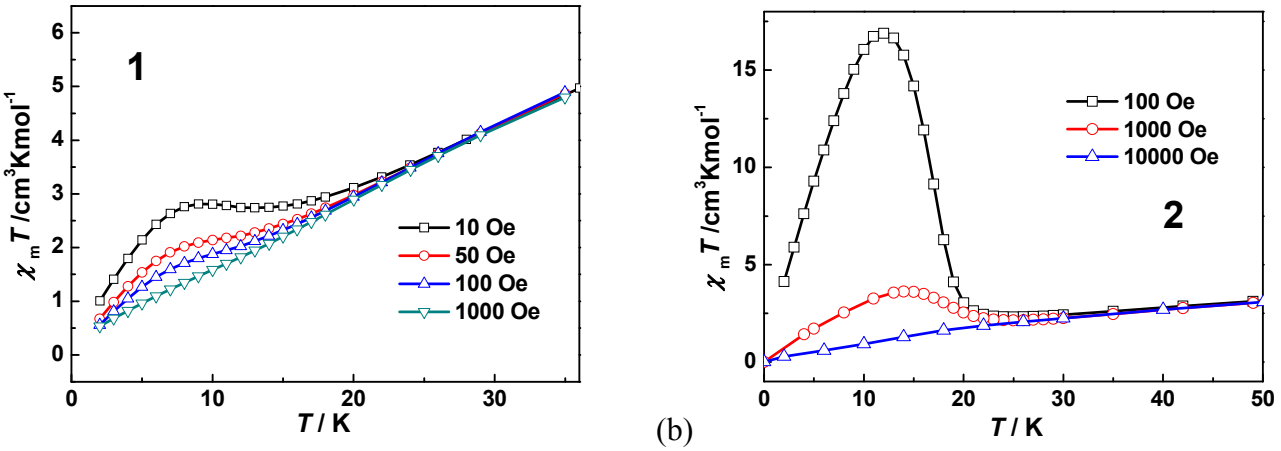

(a) (b)

**Fig. S3.** Measured and simulated PXRD patterns of **1** and **2**.



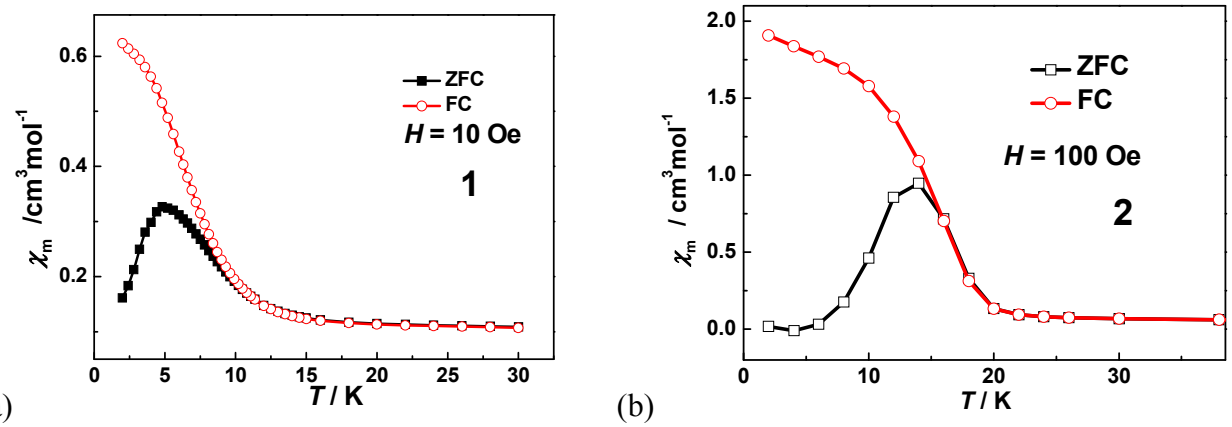

(a) (b)

**Fig. S4.** The variable-temperature PXRD patterns of **1** (a) and **2** (b).



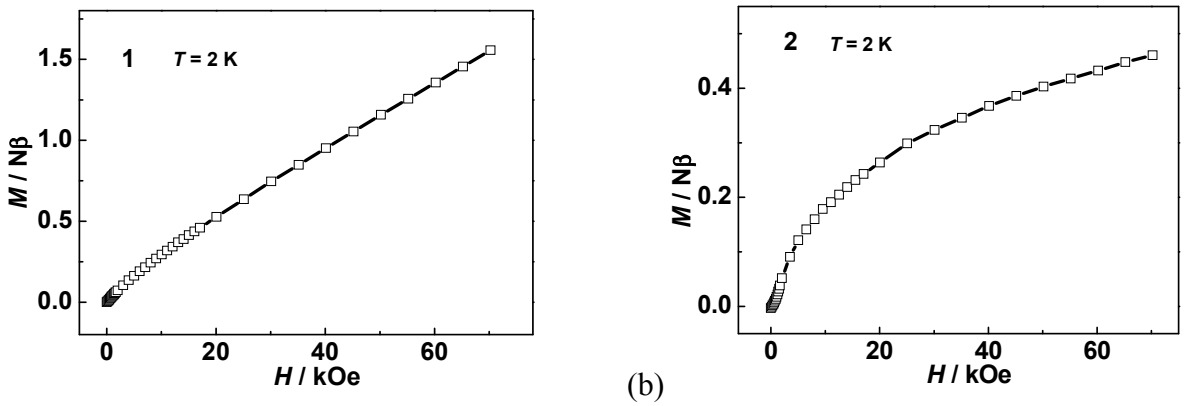

5 (a) (b)

**Fig. S5.** The temperature dependence of the magnetic susceptibility under different static fields in the low temperature range for **1** (a) and **2** (b).




(a) (b)

**Fig. S6.** ZFCM-FCM curves of **1** (a) and **2** (b).




(a) (b)

**Fig. S7.** The isothermal magnetization and hysteresis loops (inset) of **1** (a) and **2** (b) at 2 K.