Supplementary Information

Truncated octahedral coordination cage incorporating six tetranuclear-metal building blocks and twelve linear edges †

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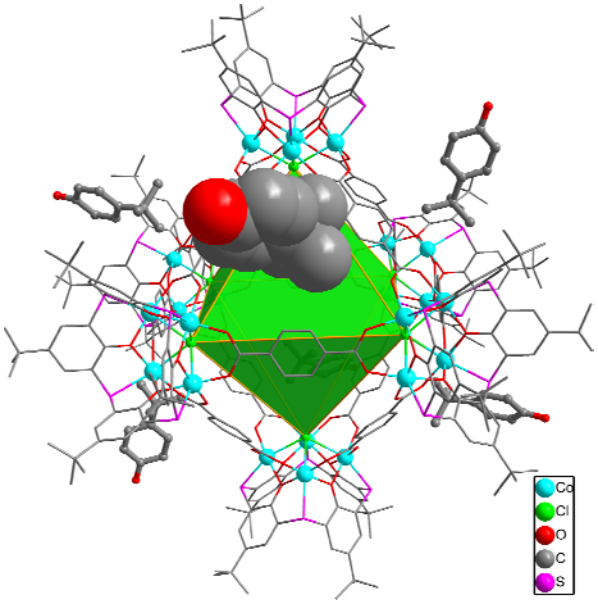

Fig. **S1** The truncated octahedron possessing eight trigonal ports at its faces. And six of them are plugged by the six adjacent nanospheres.

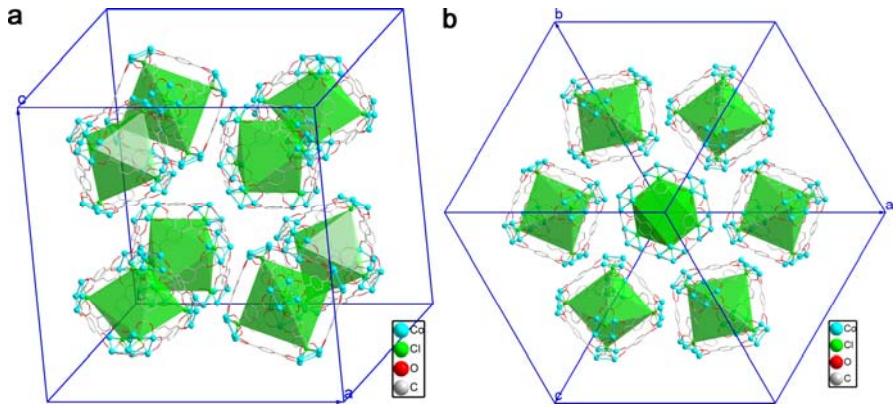

Fig. **S2** Eight nanospheres inhabit at the corner of the cell view from different directions (a) viewing along [1 -3 1] direction; (b) viewing along [1 1 1] direction. The pairs in parallel with the C_3 symmetry axis (namely, [1 1 1] direction) of the cell have the same polarity.

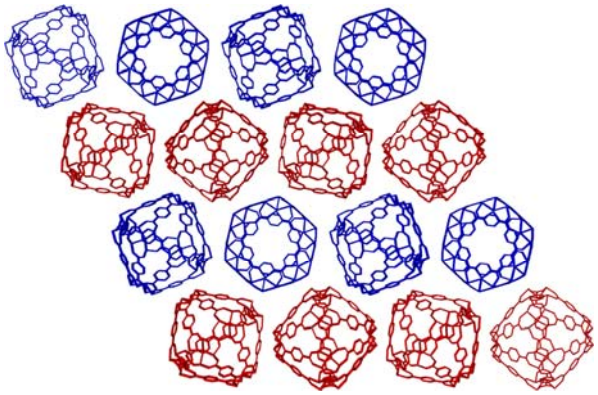

Fig. **S3** Extended structure of complex **1** showing self-assembly into a layer array with ABAB··· mode viewing along [1 1 1] direction.

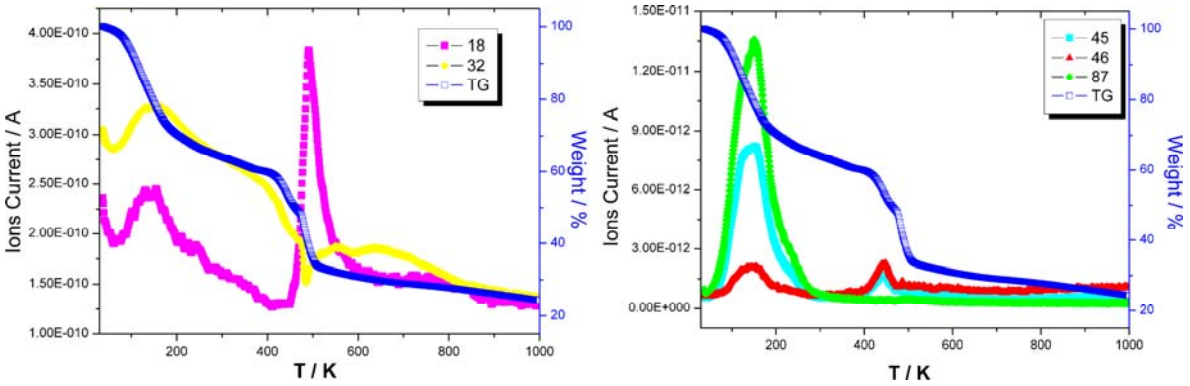

Fig. S4 TG-MS curves of complex **1**. The TG curve of complex **1** has one weight loss (27.3%) in the temperature range of 30-180 °C, and reaches a plateau until 415 °C before the decomposition reaction takes place. The observed species (m/z: 18, 32, 45, 46 and 87) show strong flux signals in the MS spectra when the temperature rises, which can be assigned to H_2O, CH_3OH, dma, $Hdma^+$ and DMA, respectively. The results indicated that the counter cations for the anionic coordination cages would be $Hdma^+$.

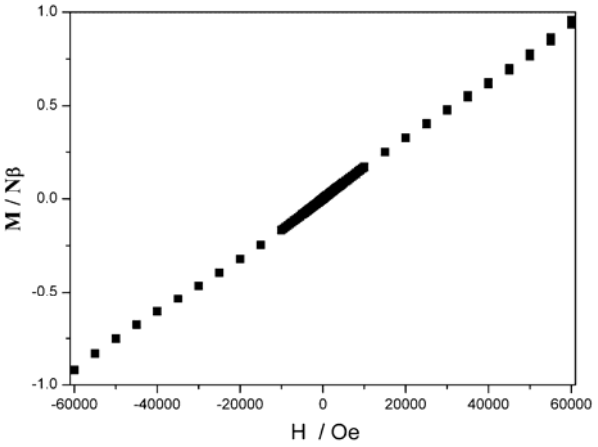

Fig. **S5** The hysteresis loop measured at 2 K in the -60 – 60 kOe range.

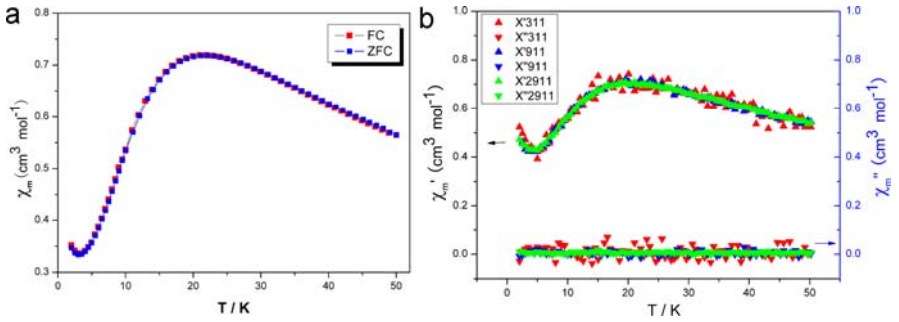

Fig. **S6** (a) The FC and ZFC curves of complex **1** with an applied field of 500 Oe. (b) The in-phase χ_{m}' and out-of-phase χ_{m}'' components of the ac susceptibility of complex **1** measured at different frequencies (311, 911, 2911 Hz) in a zero applied dc field and an ac field of 3 Oe.

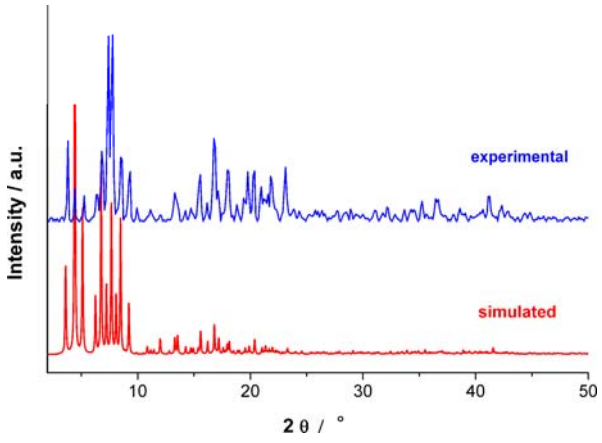

Fig. S7 PXRD of complex **1**.