Supporting Information

A series of 1D Dy(III) compound showing slow magnetic relaxation: synthesis, structure, and magnetic studies

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IR Studies.

The IR spectrum of these compounds is investigated in KBr pellets. For 1, the IR bonds of 3100 cm\(^{-1}\) is ascribed to the C-H stretching bond of L1 phenyl ring. 3353 cm\(^{-1}\) indicates that the water molecules afford H-bonds. The absence of IR bonds around 1700 cm\(^{-1}\) implies that in 1 all the L1 ligand is deprotonated. And the typical antisymmetric (1642 cm\(^{-1}\)) and symmetric (1596, 1517 cm\(^{-1}\)) stretching bands with respective values of \(\Delta v_{a}(\text{coo}^{-})-v_{s}(\text{coo}^{-})\) clearly indicate the presence of chelate (46 cm\(^{-1}\)), bidentate (125 cm\(^{-1}\)) coordination modes of the carboxyl groups. 1508 cm\(^{-1}\) is a typical IR bonds of -NO\(_2\) group. The 1,4- substituent of L1 ligand is manifested by 875 cm\(^{-1}\) IR bond. Similarly, for 2 and 3, the typical IR bonds of phenyl ring are around 3085 cm\(^{-1}\), 3067 cm\(^{-1}\). The H-bonds from water molecule are also observed, as evidenced by IR bonds of 3478 cm\(^{-1}\) for 2 and 3340 cm\(^{-1}\) for 3. The above-discussed coordination mode of carboxyl groups are also confirmed by IR spectrum: for 2, chelate and bidentate coordination mode can be deduced from the typical antisymmetric (1659 cm\(^{-1}\)) and symmetric (1605, 1530 cm\(^{-1}\)) stretching bands with respective values of \(\Delta=54, 129\) cm\(^{-1}\), whereas for 3, 1698 cm\(^{-1}\) approves monodentate coordinated mode and the corresponding IR bonds of 1617, 1555, 1487, 1421 cm\(^{-1}\) with \(\Delta=62, 130, 196\) cm\(^{-1}\) suggest chelate, bidentate, and monodentate coordinated mode. The typical IR bonds of -NO\(_2\) group is 1510 cm\(^{-1}\) for 2 and 1512 cm\(^{-1}\) for 3. As observed in 1, the IR bond of 1,4-substituent of L1 ligand in 3 is about 875 cm\(^{-1}\). By contrast, the IR bond of 1,3-substituent of L2 ligand in 2 is around 783 cm\(^{-1}\), 720 cm\(^{-1}\).

**Fig. S1** The frequency dependent ac susceptibility data under dc=1000 Oe, ac=3 Oe.

**Fig. S2** The experimental/red XRD pattern of bulk samples and simulated/black XRD pattern from single crystal data of 2.

**Fig. S3** The experimental/red XRD pattern of bulk samples and simulated/black XRD pattern from single crystal data of 3.