# Electronic Supporting Information for:

# Rare Earth Anthracenedicarboxylate Metal-Organic Frameworks: Slow Relaxation of Magnetization of $Nd^{3+}$, $Gd^{3+}$, $Dy^{3+}$, $Er^{3+}$ and $Yb^{3+}$ based Materials.

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## 1. Luminescence Studies

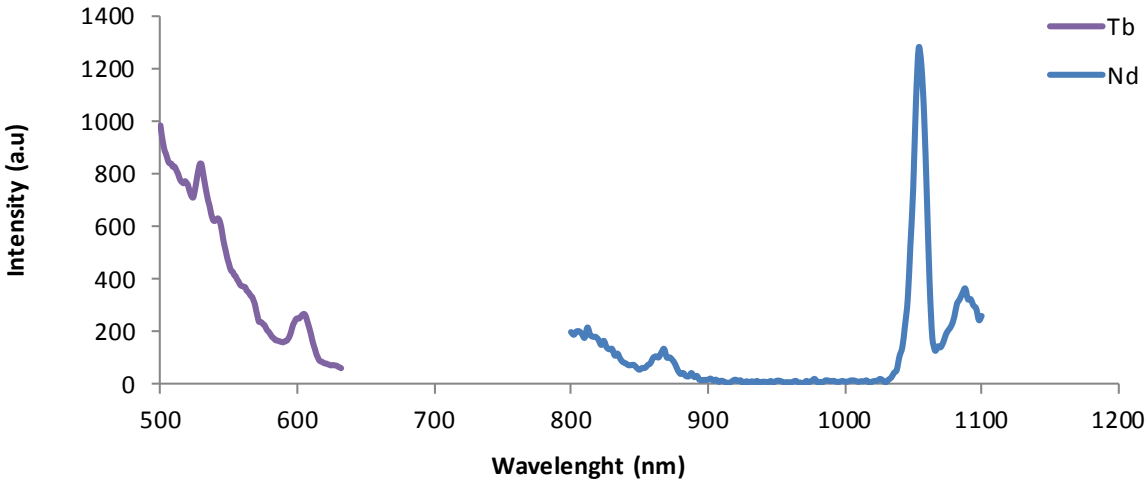


**Figure S1**. Typical emission bands of $Nd^{3+}$ and $Tb^{3+}$ ions.

**Table S1**. Bond distances (Å) for **1-5** and **7**

| compound 1 | 2 | 3 | 4 | 5 | 7 | |
|---|---|---|---|---|---|---|
| Pr1 O1B 2.413(3) | Nd1 O1B 2.327(5) | Gd1 O1B 2.335(3) | Tb1 O1B 2.326(4) | Dy1 O1B 2.3046(17) | Yb1 O4C 2.209(4) | Yb2 O1J 2.311(5) |
| Pr1 O1E 2.458(3) | Nd1 O1E 2.366(7) | Gd1 O1D 2.374(4) | Tb1 O1E 2.367(6) | Dy1 O1D 2.3678(19) | Yb1 O1Z 2.215(6) | Yb2 O2C 2.376(6) |
| Pr1 O1D 2.475(3) | Nd1 O1D 2.398(6) | Gd1 O1E 2.412(3) | Tb1 O1D 2.401(5) | Dy1 O1E 2.4005(19) | Yb1 O2A 2.235(4) | Yb2 O1C 2.391(6) |
| Pr1 O1C 2.501(3) | Nd1 O1C 2.421(6) | Gd1 O1C 2.430(3) | Tb1 O1C 2.420(5) | Dy1 O1C 2.4080(18) | Yb1 O1D 2.254(5) | Yb2 O4N 2.403(5) |
| Pr1 O1A 2.509(3) | Nd1 O1A 2.430(5) | Gd1 O2B 2.445(3) | Tb1 O1A 2.425(5) | Dy1 O1A 2.4241(19) | Yb1 O1B 2.325(5) | Yb2 O5N 2.408(5) |
| Pr1 O2B 2.516(3) | Nd1 O2B 2.436(5) | Gd1 O1A 2.448(3) | Tb1 O2B 2.438(5) | Dy1 O2B 2.4309(18) | Yb1 O2N 2.410(6) | Yb2 N2N 2.850(7) |
| Pr1 O2A 2.537(3) | Nd1 O2A 2.481(5) | Gd1 O2A 2.473(3) | Tb1 O2A 2.482(5) | Dy1 O2A 2.4556(19) | Yb1 O1N 2.418(6) | Yb3 O4A 2.223(5) |
| Pr1 O2C 2.598(3) | Nd1 O2C 2.482(6) | Gd1 O2C 2.507(4) | Tb1 O2C 2.486(5) | Dy1 O2C 2.4963(19) | Yb1 O2B 2.439(5) | Yb3 O3A 2.231(5) |
| Pr1 O1C 2.625(3) | Nd1 O1C 2.595(5) | Gd1 O1C 2.546(3) | Tb1 O1C 2.600(5) | Dy1 O1C 2.5439(18) | Yb1 N1N 2.818(7) | Yb3 O1G 2.272(7) |
| Pr1 C1A 2.871(5) | Nd1 C1A 2.806(8) | Gd1 C1A 2.817(5) | Tb1 C1A 2.808(7) | Dy1 C1A 2.798(3) | Yb2 O1A 2.225(4) | Yb3 O3B 2.316(5) |
| Pr1 C1C 2.965(4) | Nd1 C1C 2.905(8) | Gd1 C1C 2.893(5) | Tb1 C1C 2.905(7) | Dy1 C1C 2.882(3) | Yb2 O1F 2.267(6) | Yb3 O4B 2.388(6) |
| Pr1 Pr1 4.1125(6) | Nd1 Nd1 4.029(2) | Gd1 Gd1 4.0130(7) | Tb1 Tb1 4.028(6) | Dy1 Dy1 3.9962(3) | Yb2 O3C 2.267(5) | Yb3 O7NA 2.407(11) |

## 3. Magnetic Properties

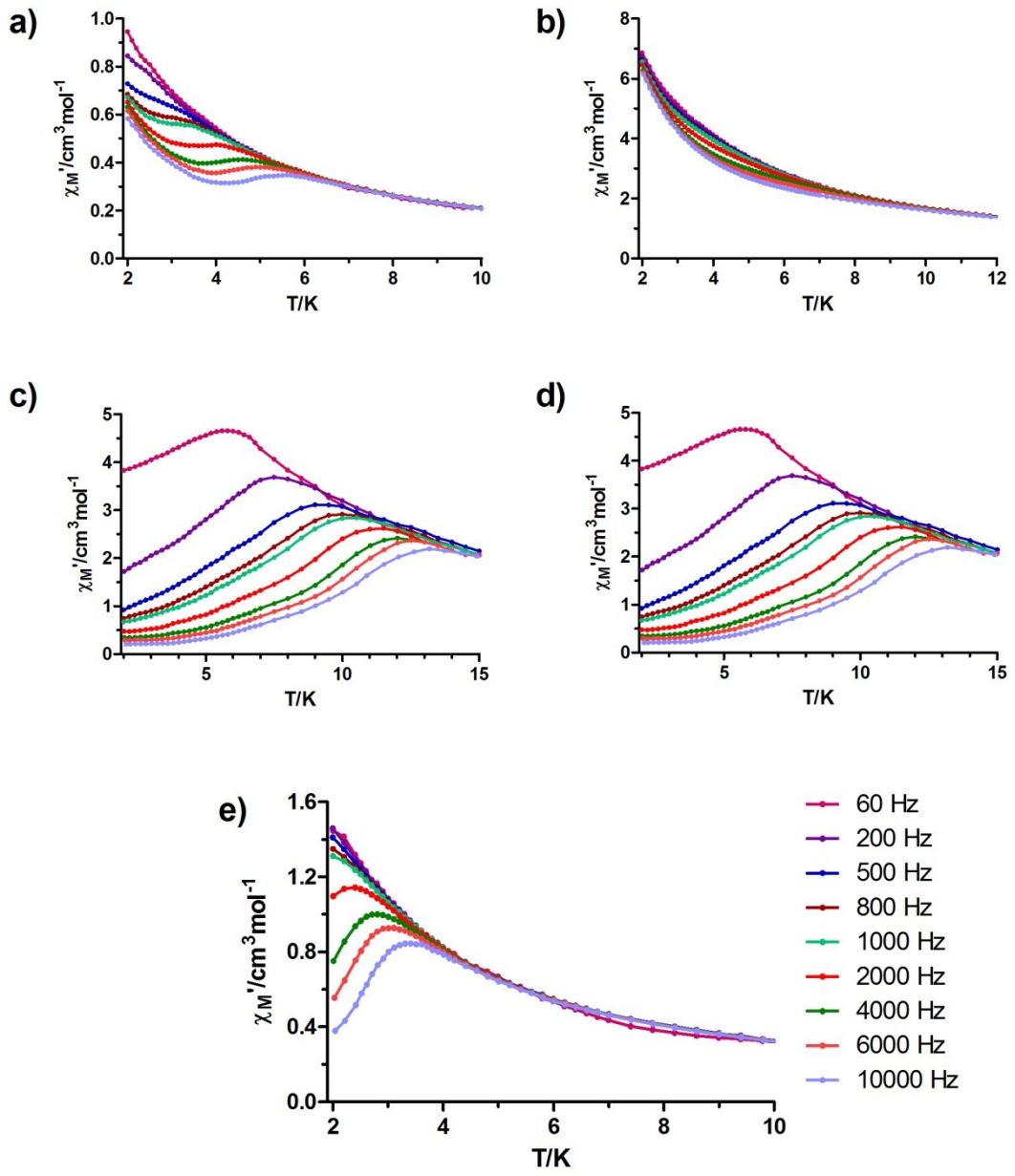


**Figure S2**. Temperature dependence of the in-phase $\chi'_M$ components of the *ac* susceptibility for **2** (a), **3** (b), **5** (c), **6** (d) and **7** (e) under an external field of 1000 Oe

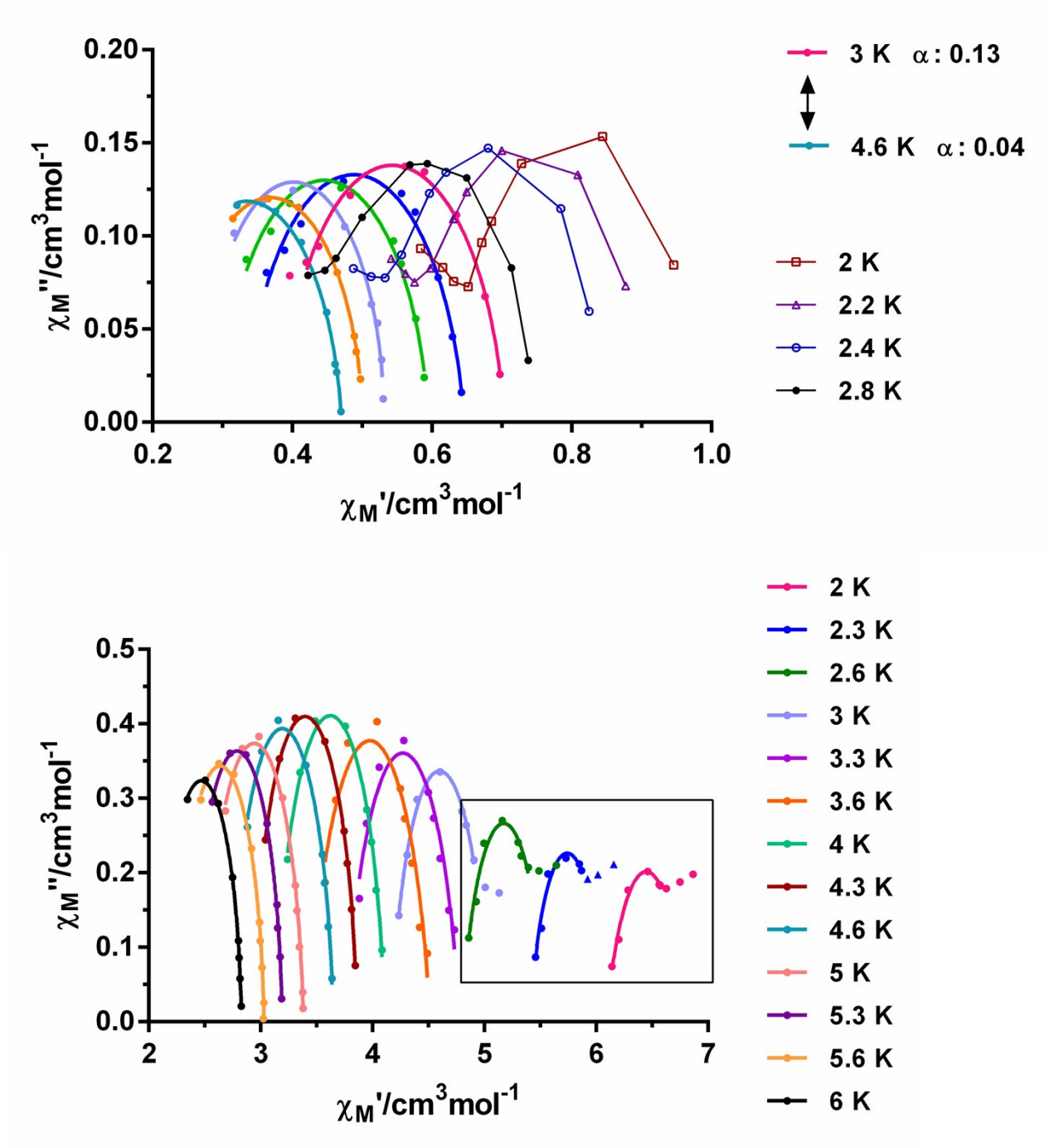


**Figure S3**. Cole-Cole plots under 1000 Oe external field for **2** (top) and **3** (bottom). Curve solid lines represent the best fits to the generalized Debye model. Two relaxation processes are observed for 2 and 3 in the 2-3 K and 2-2.6 temperature ranges, respectively.

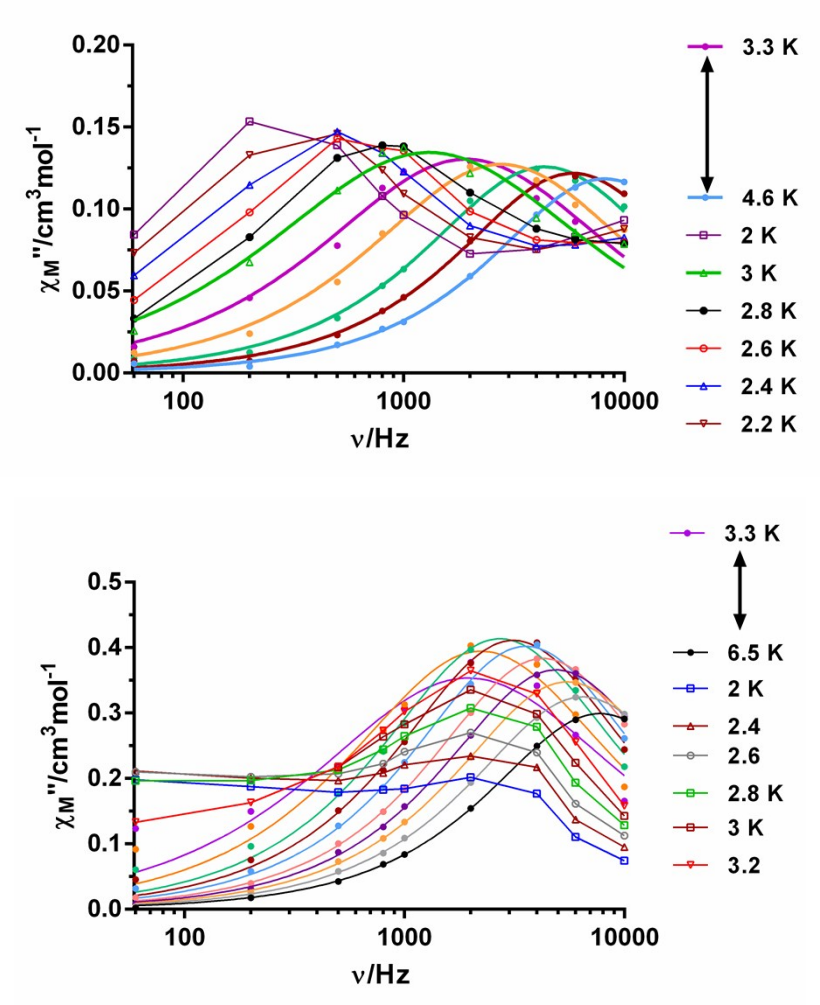


**Figure S4**. Variable-temperature frequency dependence of the $\chi''_M$ signal under 1000 Oe external field for **2** (top) and **3** ( bottom). Two relaxation processes are observed for **2** (in the low frequency region) and **3** (in the high frequency region). Solid lines represent the best fits to the generalized Debye model.

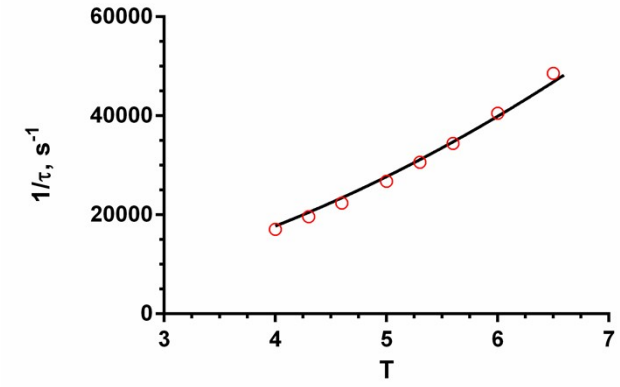


**Figure S5**.- Fitting of the 1/τ data vs T for **3** to the equation $\tau^{-1} = AT^2$

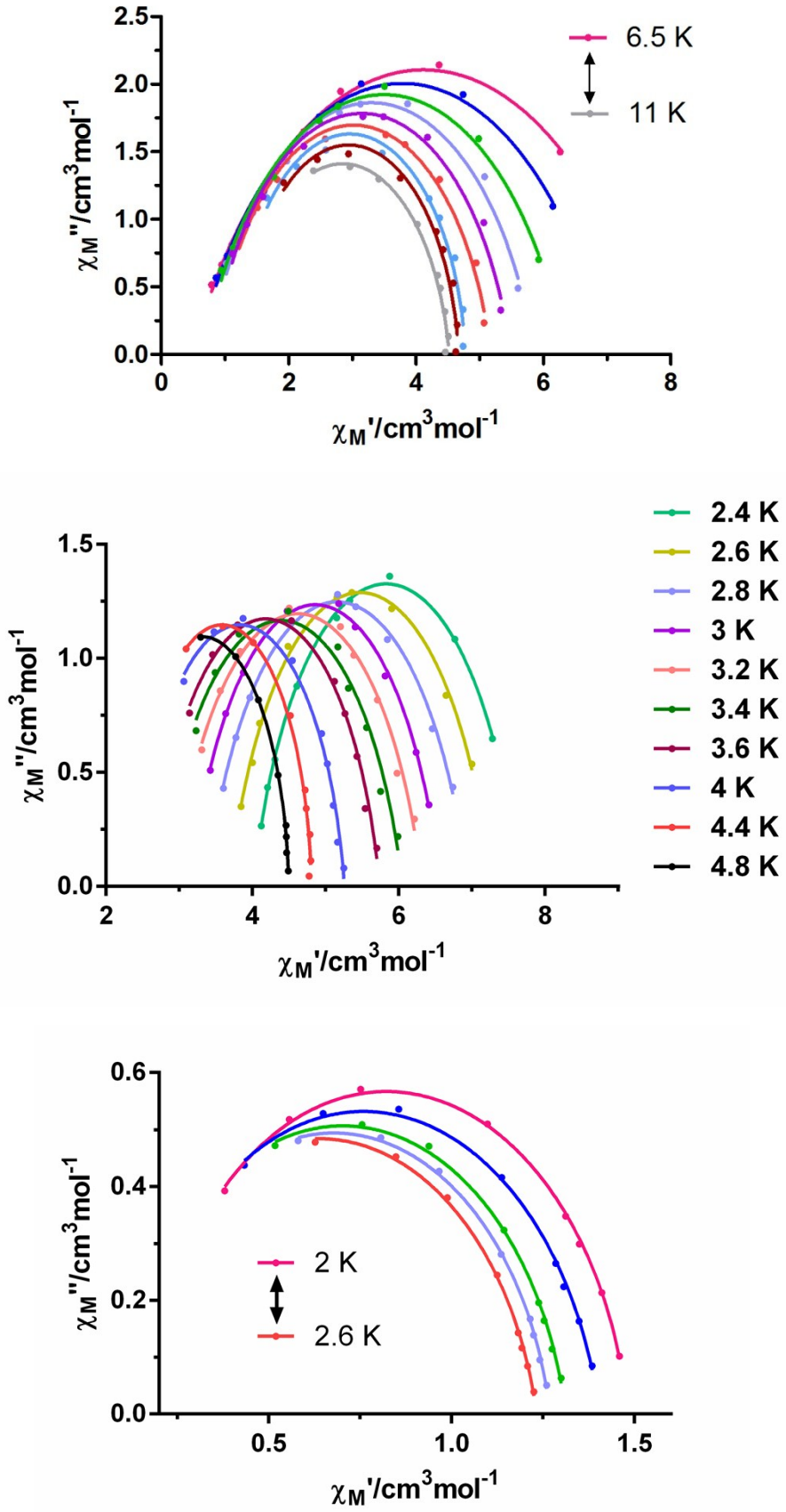


**Figure S6**. Cole-Cole plots under 1000 Oe external field for **5** (top), **6** (medium) and **7** (bottom). Solid lines represent the best fits to the generalized Debye model.

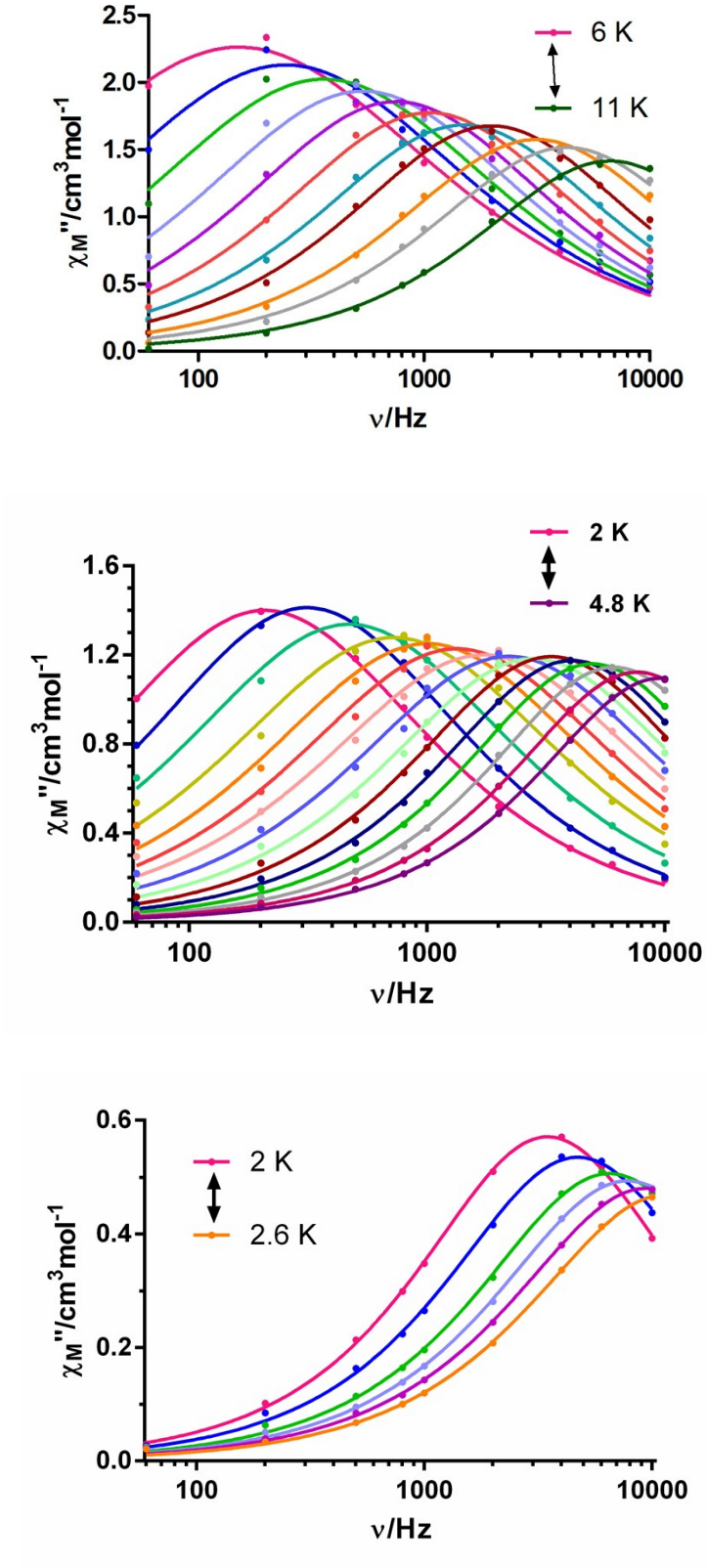


**Figure S7**. Variable-temperature frequency dependence of the $\chi''_M$ signal under 1000 Oe external field for **5** (top), **6** (medium) and **7** (bottom). Solid lines represent the best fits to the generalized Debye model.

## 4. LeBail Refinement for MOF 6

Compound **6** is isostructural to **5**. We realized a LeBail refinement (Figure S0) with TOPAS software to stablish the purity and the unit cell of the powders pertaining to this material.

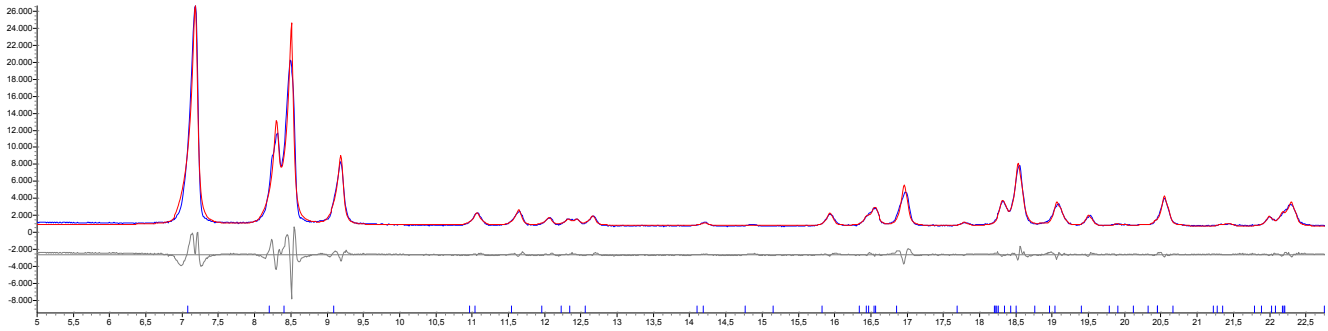

**Figure S8**. Lebail Refinement for **6**: *a* = 10.52, *b* =11.30, *c* = 13.07, *α* = 72.59, *β =89.75*, *γ =87.97*, *V* =1481.73, *sample displacement* = -0.205mm