# *Supplementary Information*

## Luminescent and magnetic [TbEu] 2D Metal-Organic Frameworks

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**S1. Infrared spectra of Ln 2D MOFs**

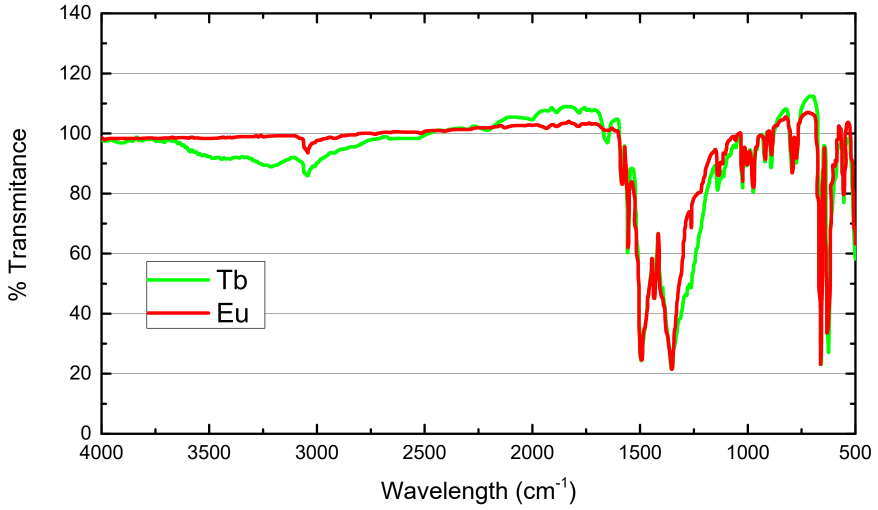
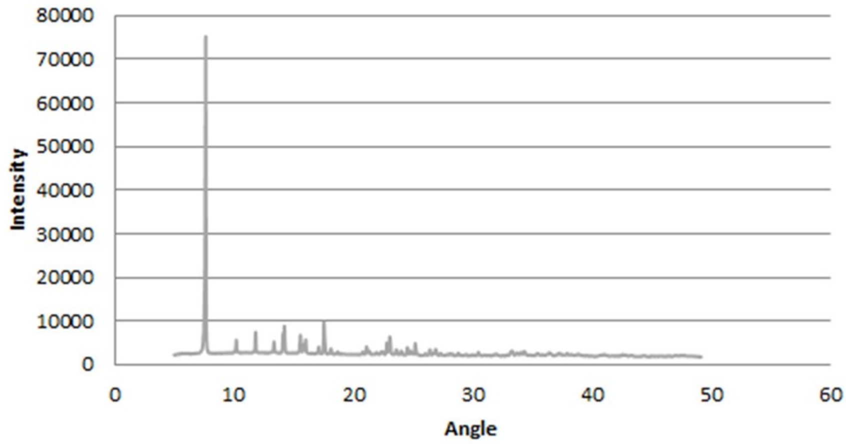


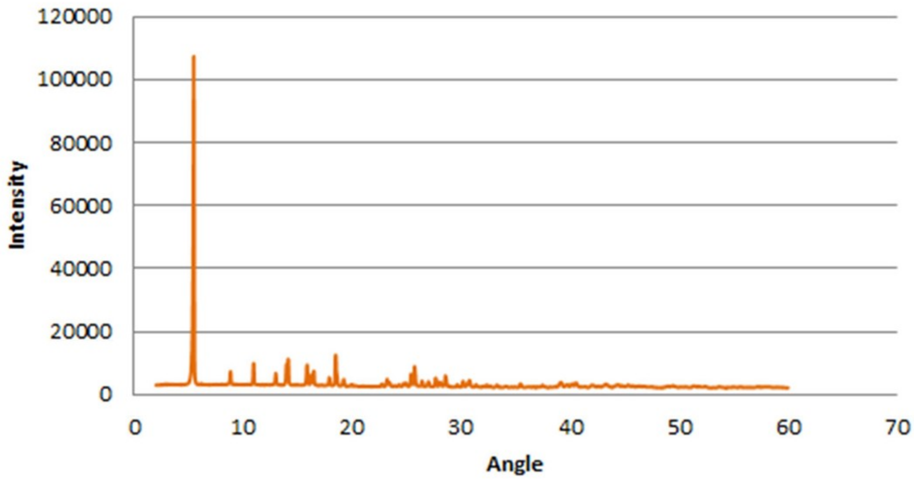

**Figure S1.** Infrared spectra of homometallic Ln 2DMOFs (Ln= Tb, Eu).

**S2. PXRD**

## Dy




## $Tb_{0.3}Eu_{0.7}$




## $Tb_{0.2}Eu_{0.8}$

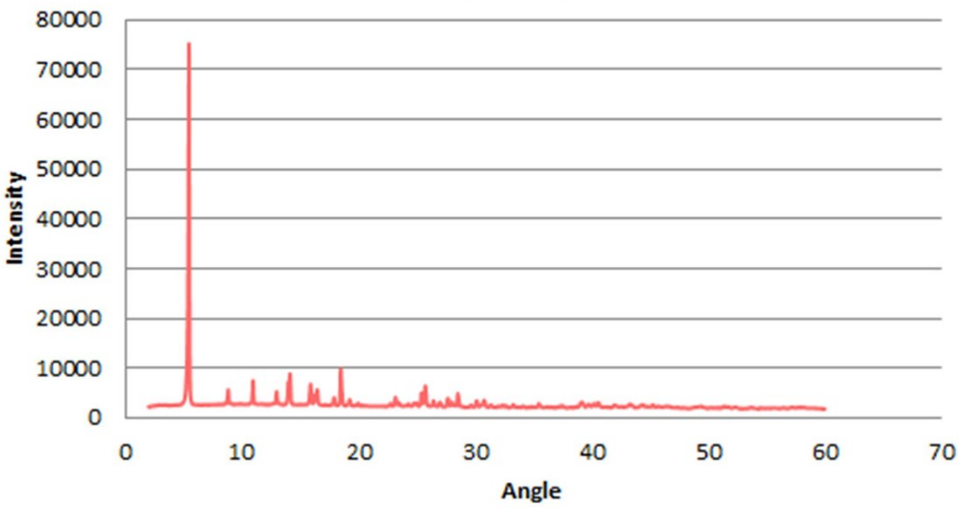



**Figure S2**. PXRD spectra of the studied mixed compounds (the rest are shown in Fig. 2 of the main paper).

## S3. Tb/Eu ratio analysis

| Sample name | ICP | | SEM-EDS | | TEM-EDX | | Fluorescence | |
|---|---|---|---|---|---|---|---|---|
| **$Tb_xEu_{1-x}$** | **Tb** | **Eu** | **Tb** | **Eu** | | | **Tb** | **Eu** |
| **$Tb_{0.2}Eu_{0.8}$** | 0.17 | 0.83 | 0.25 | 0.75 | | | | |
| **$Tb_{0.3}Eu_{0.7}$** | 0.28 | 0.72 | 0.36 | 0.64 | | | | |
| **$Tb_{0.4}Eu_{0.6}$** | 0.42 | 0.58 | | | 0.42 | 0.58 | | |
| **$Tb_{0.7}Eu_{0.3}$** | 0.71 | 0.29 | | | | | 0.73 | 0.27 |
| **$Tb_{0.9}Eu_{0.1}$** | 0.86 | 0.14 | | | | | 0.88 | 0.13 |

**Table S3** Tb/Eu ratios determined for the heteronuclear samples by ICP (standard error <2%), SEM-EDS, TEM-EDX and Fluorescence.

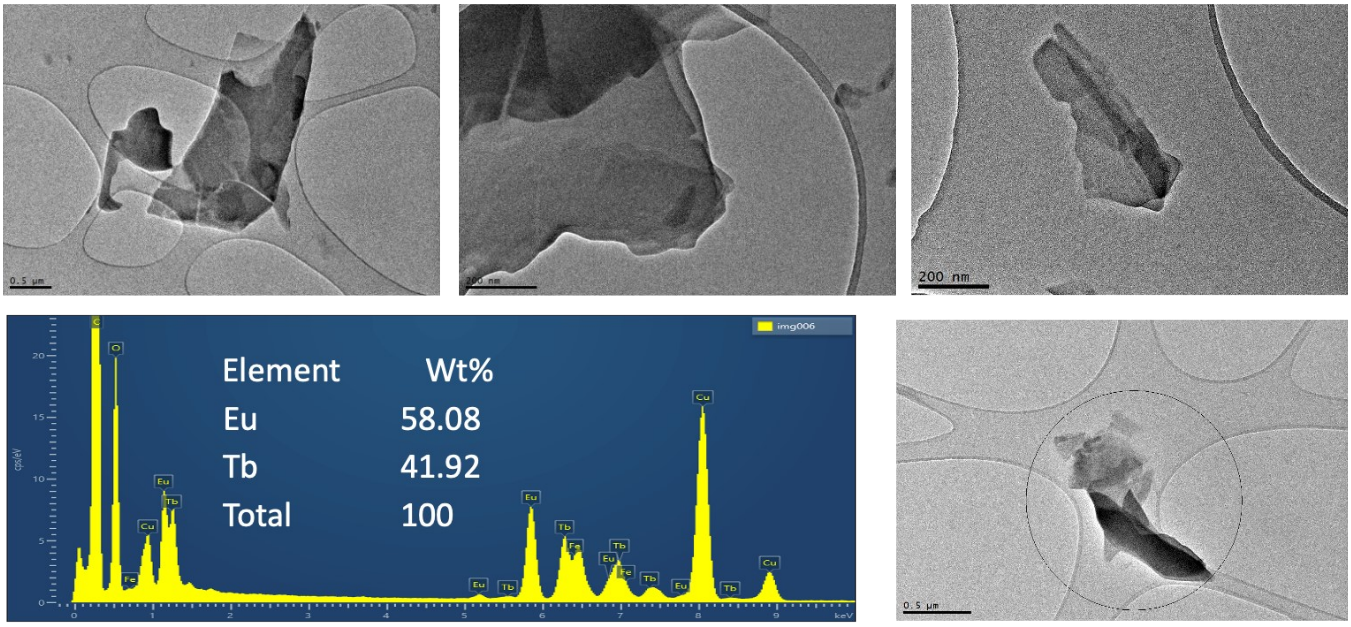



**Figure S3**. TEM images showing exfoliated flakes of **$Tb_{0.4}Eu_{0.6}$** and EDX analysis.

## S4. Color emission under UV light

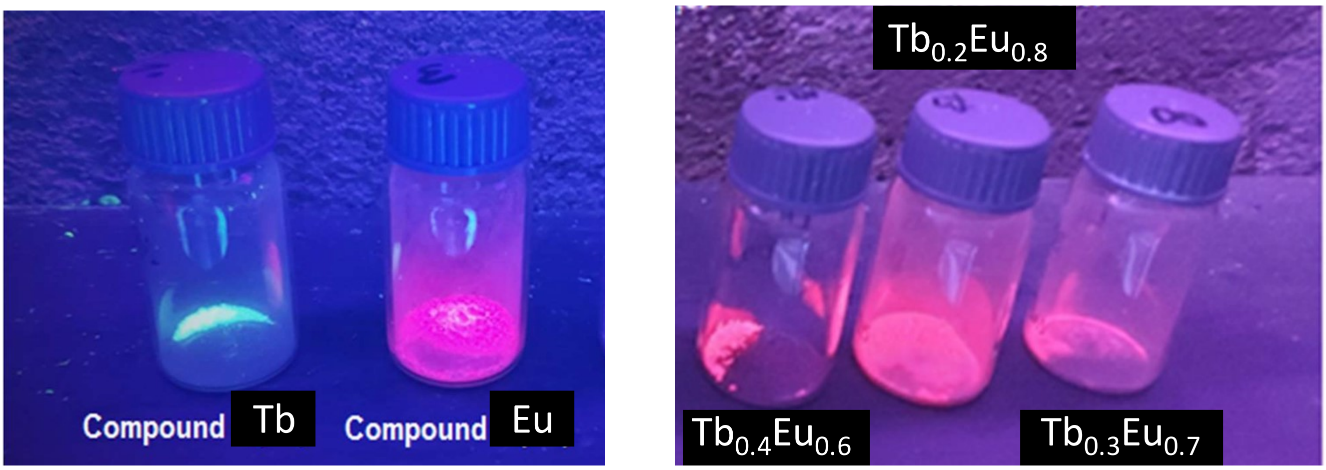



**Figure S4.** Visible color emission of (left) homonuclear **Tb**, **Eu** compounds, and (right) heteronuclear [TbEu] compounds, under UV light.

**S5. Luminescence lifetime measurements**

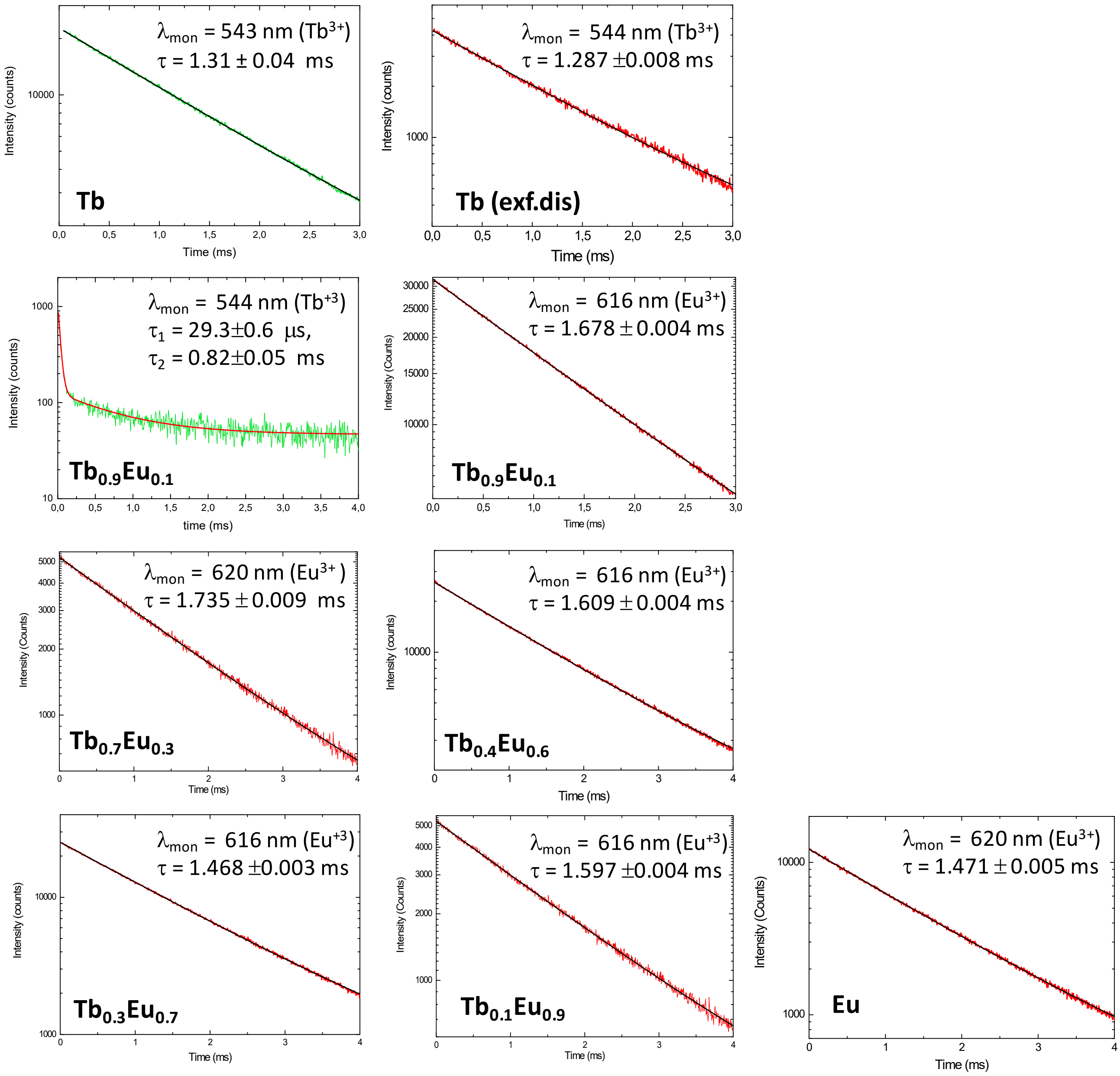



**Figure S5.** Lifetime measurements for homonuclear Tb and Eu compounds, and heterodinuclear $Tb_xEu_{1-x}$ compounds, excited at $\lambda_{exc}$=280 nm. The decay of either the $Eu^{3+}$ main peak at 620 nm peak, or the $Tb^{3+}$ peak at 544 nm were monitored. For $\mathbf{Tb_{0.9}Eu_{0.1}}$ the lifetime data were fit to a biexponential law with two time constants ($\tau_1$ and $\tau_2$): $I(t)= A_1.\exp(-t/ \tau_1)+ A_2.\exp(-t/\tau_2)+I_0$, with $A_1$=1022±16, $\tau_1$=29.3±0.6 μs, $A_2$=80±2, $\tau_2$=0.82±0.05 μs), $I_0$=46.5±0.8. For all other compounds the data were fit to an exponential decay law with a single time constant ($\tau$).

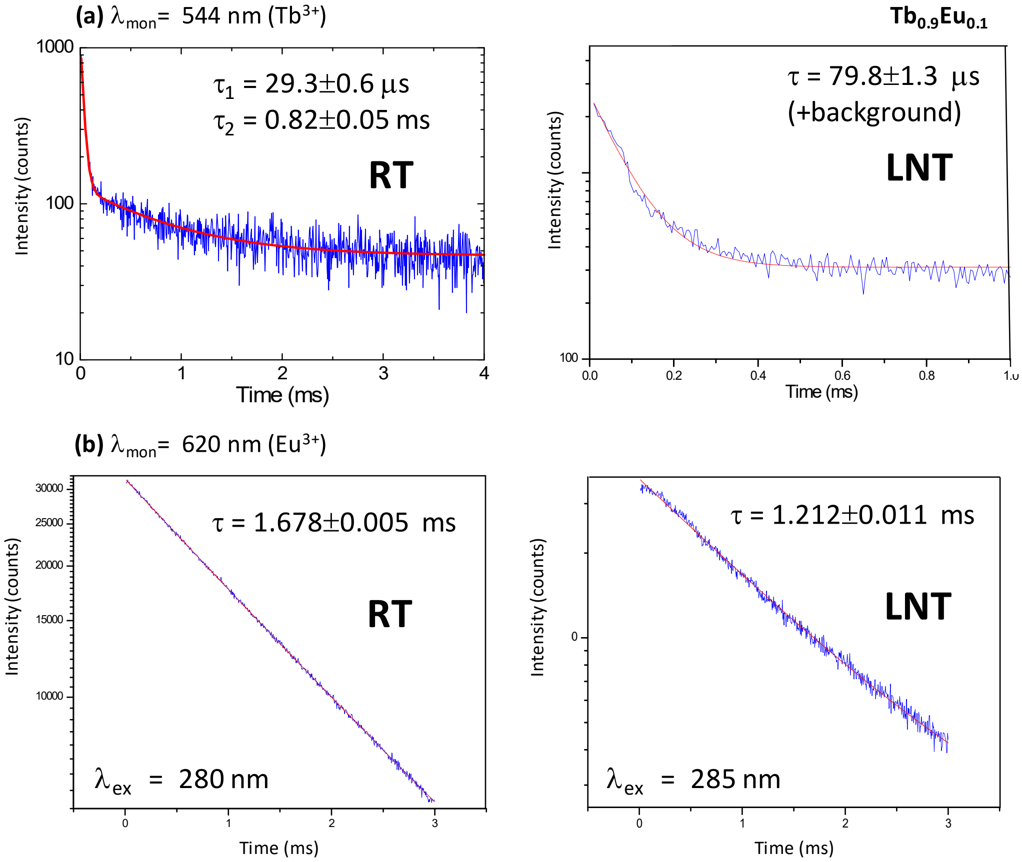



**Figure S6.** Lifetime measurements for heterodinuclear **$Tb_{0.9}Eu_{0.1}$** compound, monitored at (a) the $Tb^{3+}$ main peak at 544 nm and (b) the $Eu^{3+}$ main peak at 620 nm peak at, at (left) room temperature (RT), and (right) liquid nitrogen temperature (LNT).

**S6. Emission of mixed compound $Tb_{0.9}Eu_{0.1}$**

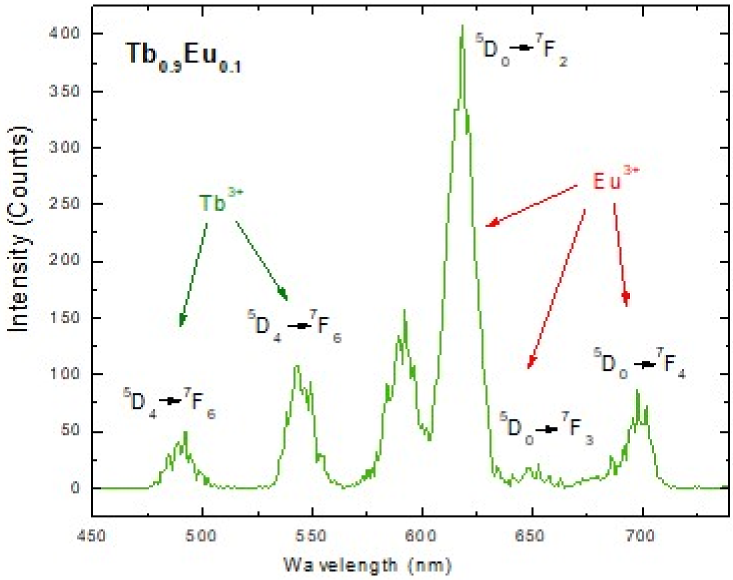
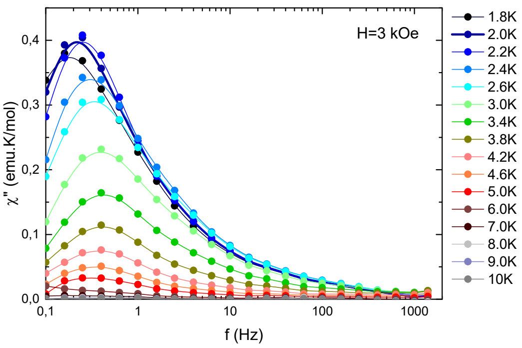



**Figure S7.** Emission spectra of complex $\mathbf{Tb_{0.9}Eu_{0.1}}$ excited at $\lambda_{exc}$=280 nm, measured in. Fluorolog FL-1057, Jobin Ybon HORIBA. The characteristic emission bands for $Tb^{3+}$ and $Eu^{3+}$ are visible.

**S7. Ac susceptibility ox mixed compound $Tb_{0.9}Eu_{0.1}$**



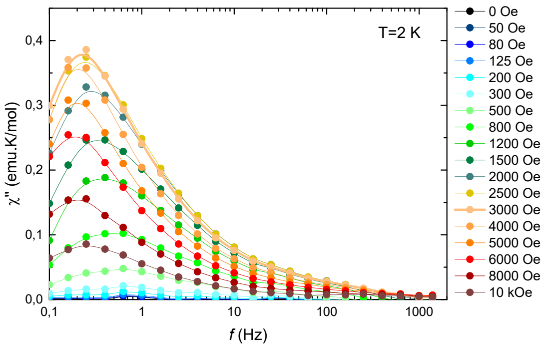




**Figure S8.** Ac susceptibility results. (Left) *χ''*(*f*, *T*) at constant magnetic field *H*=3 kOe and (Right) *χ''*(*f*, *H*) at constant *T*=2 K for mixed compound $\mathbf{Tb_{0.9}Eu_{0.1}}$.

## S8. Bottleneck effect

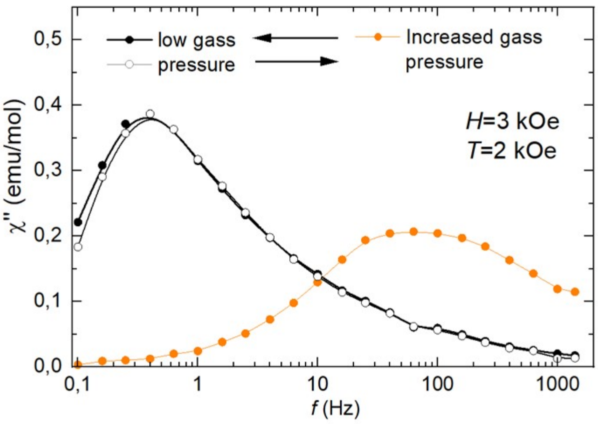



**Fig. S9** $\chi''(f)$ measurements on pure **Tb** compound at *H*= 3 kOe and *T*= 2 K at different experimental SQUID pressure conditions, showing the influence of the bottleneck effect.