Electronic Supplementary Material (ESI) for Dalton Transactions.


# Supplementary Information

## Visible light sensitized near-infrared luminescence of ytterbium via ILCT states in quadruple-stranded helicates

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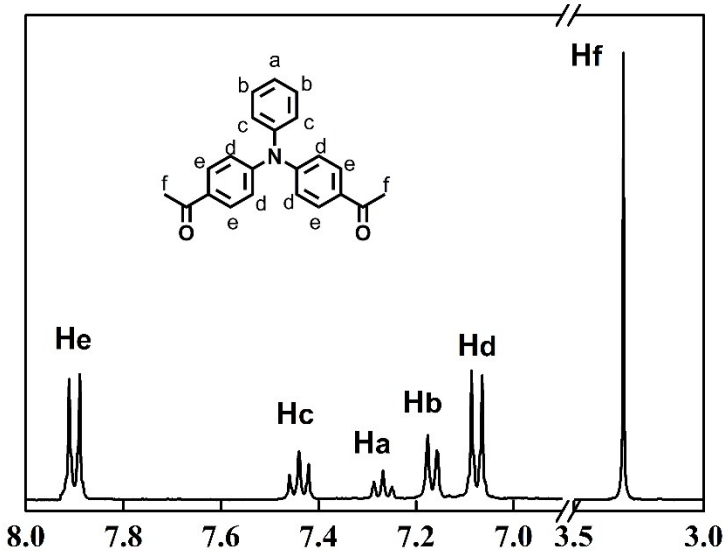


**Figure S1.** $^1$H NMR spectrum of 4,4'-diacetyl triphenylamine in DMSO-*d6*.

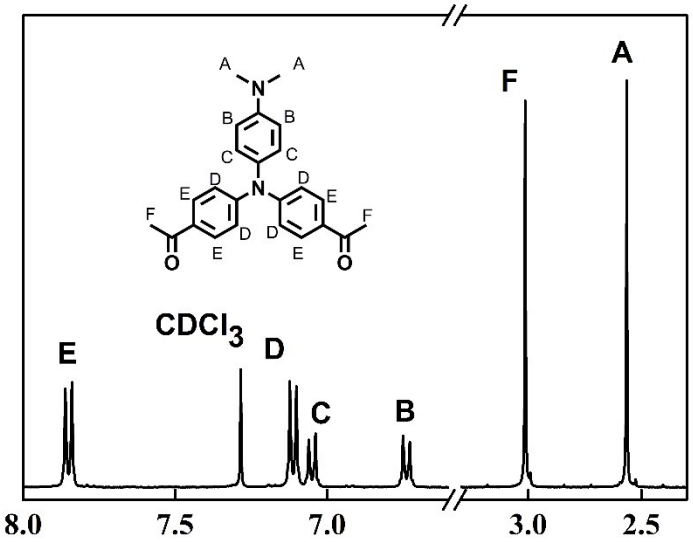


**Figure S2.** $^1$H NMR spectrum of 4-(N,N-Dimethylamino)-4',4''-diacetyltriphenylamine in $CDCl_3$

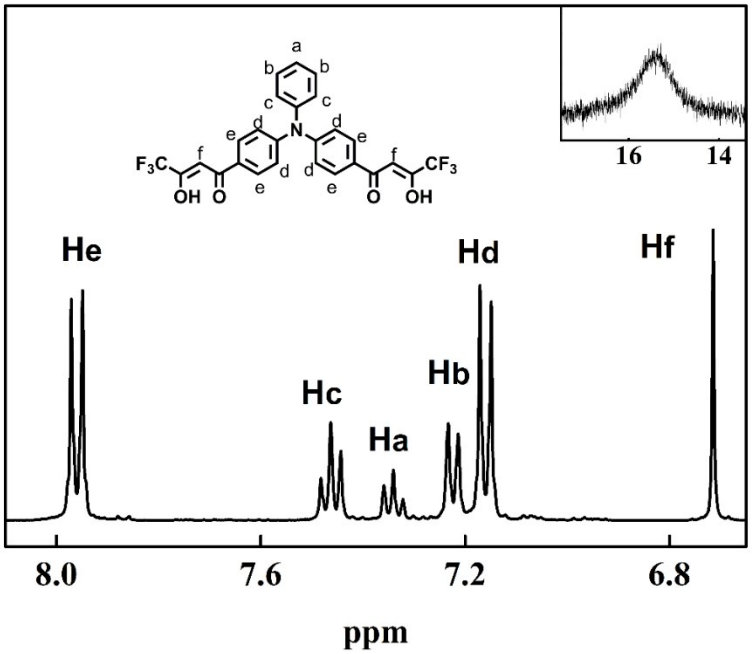


**Figure S3.** $^1$H NMR spectrum of **L$^1$** in DMSO-*d6*.

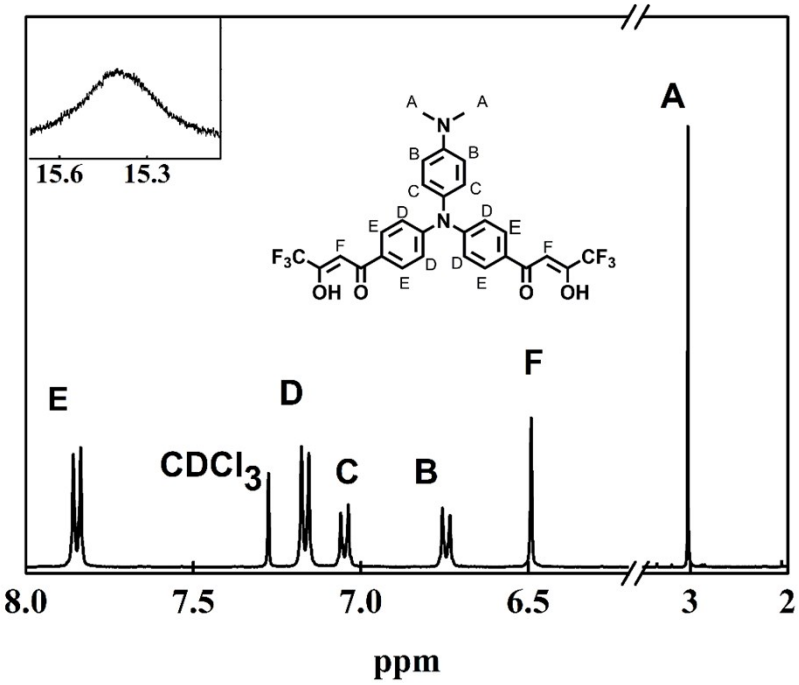


**Figure S4.** $^1$H NMR spectrum of **L$^2$** in $CDCl_3$.

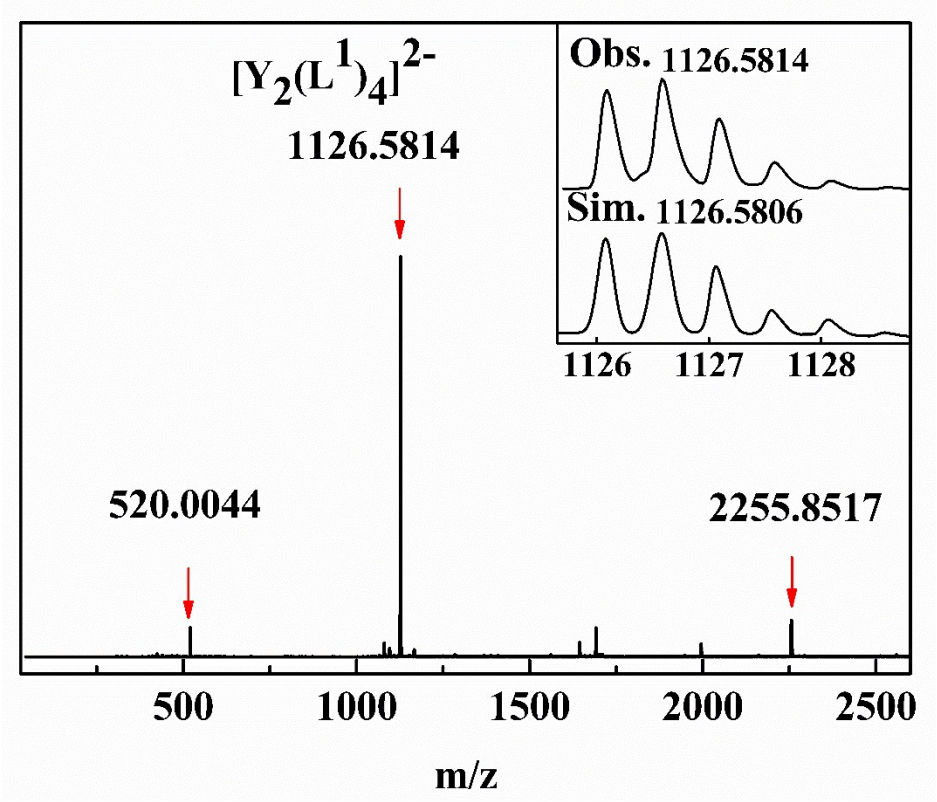


**Figure S5.** ESI-TOF-MS of $[Y_2(\mathbf{L}^1)_4]$.

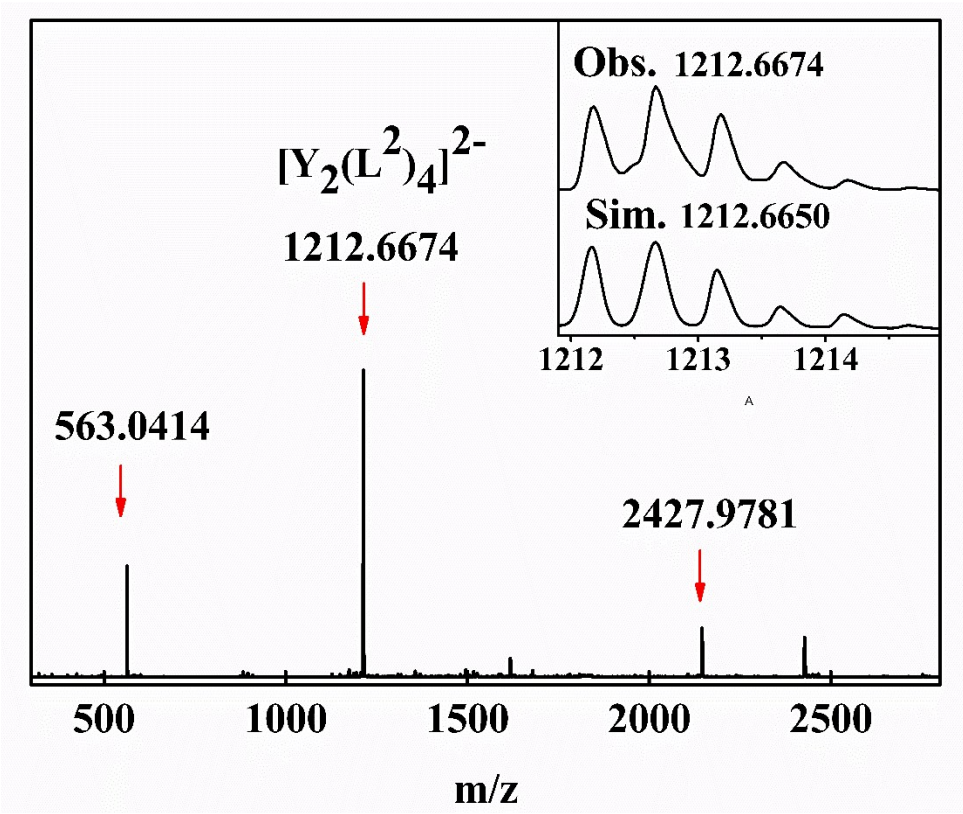


**Figure S6.** ESI-TOF-MS of $[Y_2(\mathbf{L}^2)_4]$.

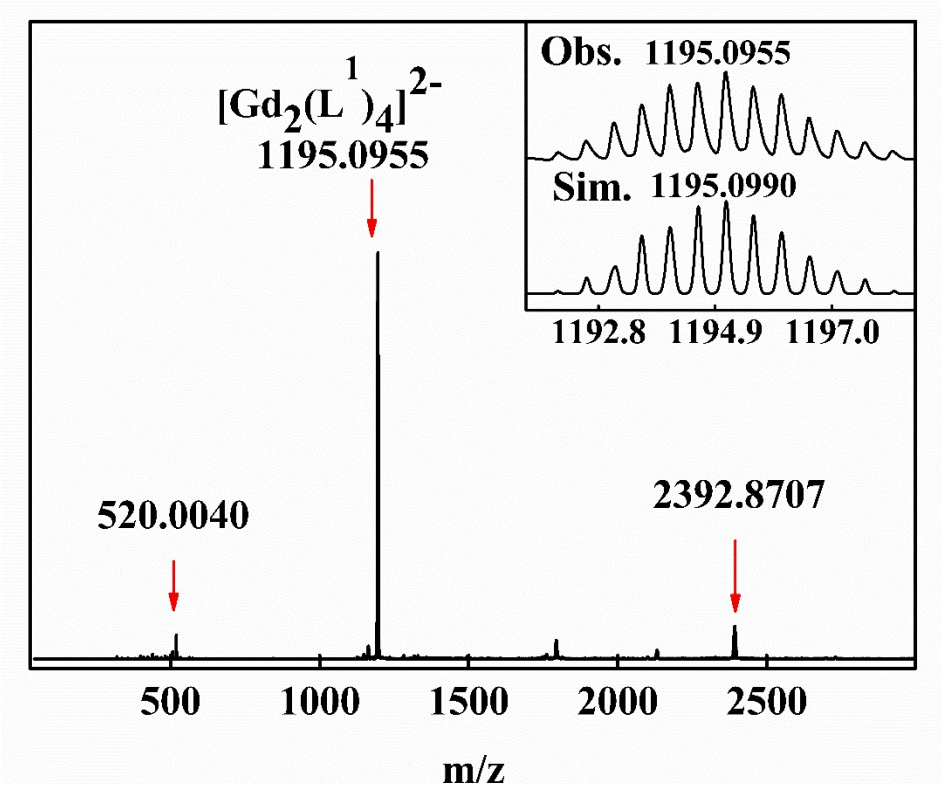


**Figure S7.** ESI-TOF-MS of $[Gd_2(\mathbf{L^1})_4]$.

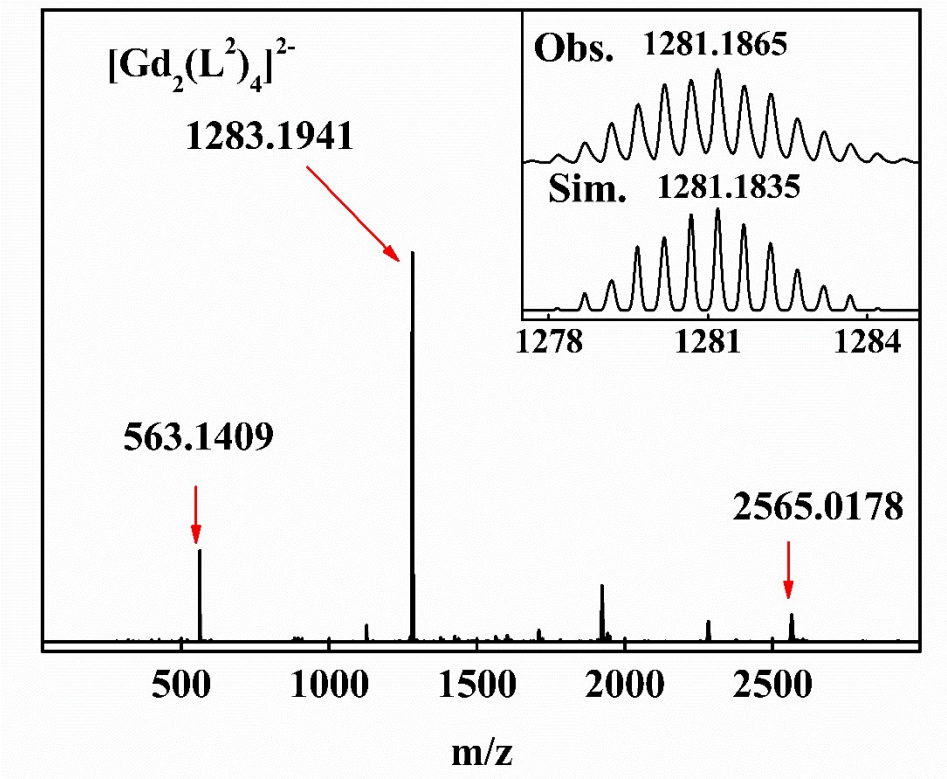


**Figure S8.** ESI-TOF-MS of $[Gd_2(\mathbf{L^2})_4]$.

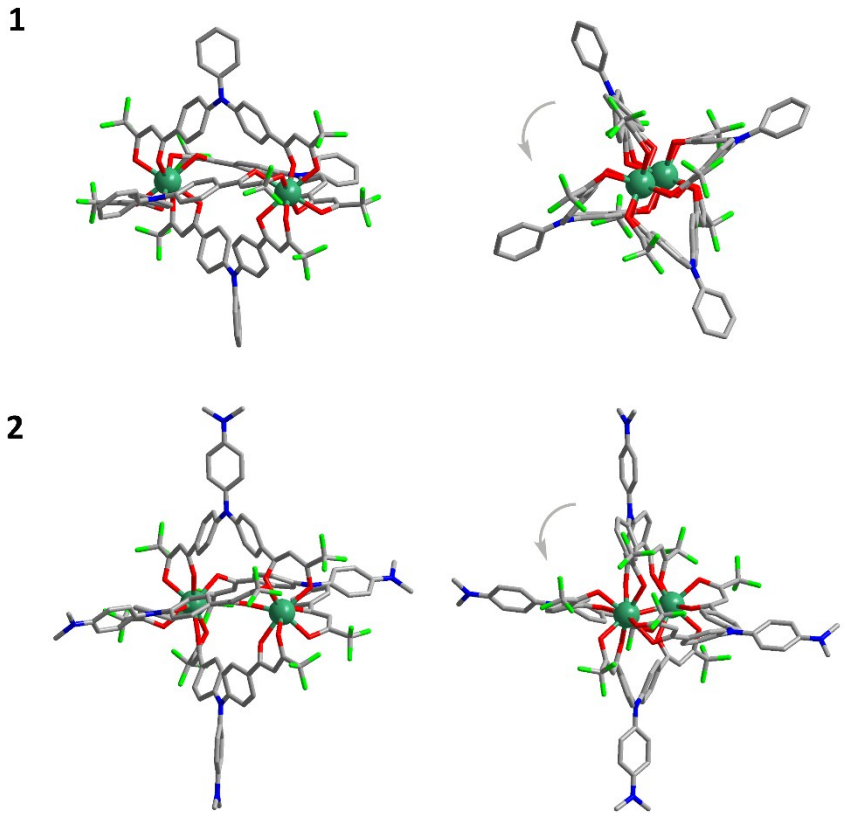


**Figure S9.** Side view (left) and top view (right) of the structures of complexes **1** and **2** optimized by Sparkle/PM6 model (For clearance, only right-handed Δ–Δ helix are presented).

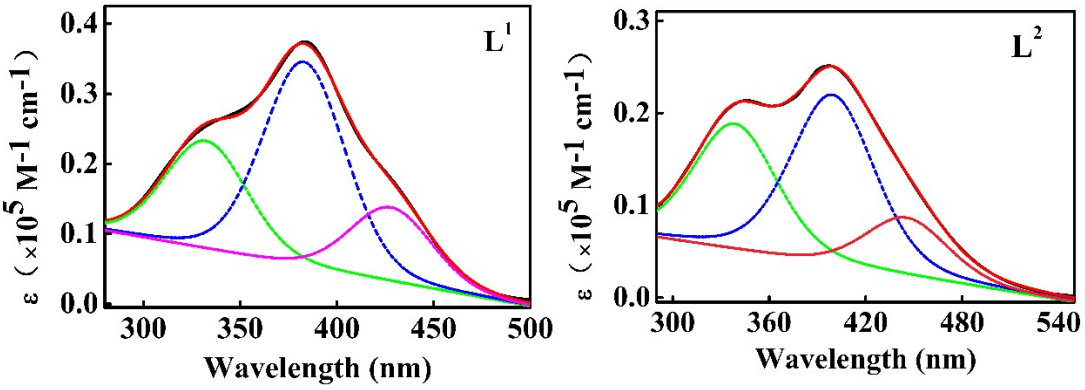


**Figure S10**. Experimental UV/Vis absorption spectra (solid black line), respective Gaussian deconvolutions (dashed lines), and best fit (solid red line): R=0.9995 (for $L^1$), and R=0.9999 (for $L^2$).

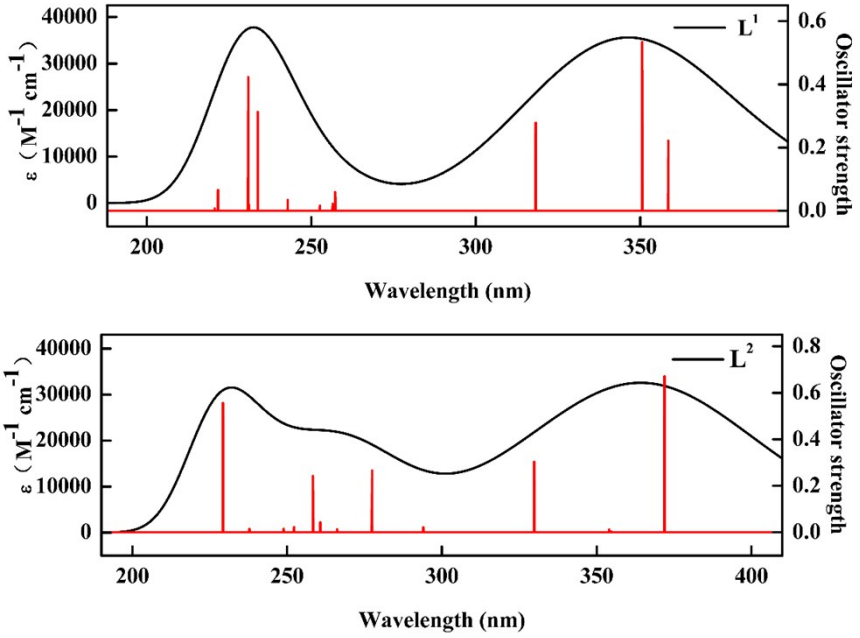


**Figure S11**. Theoretical UV–Visible absorption spectra of $L^1$ (up) and $L^2$ (down) and selected most pertinent lowlying electronic transitions and assignment of **$L^1$**, **$L^2$**.

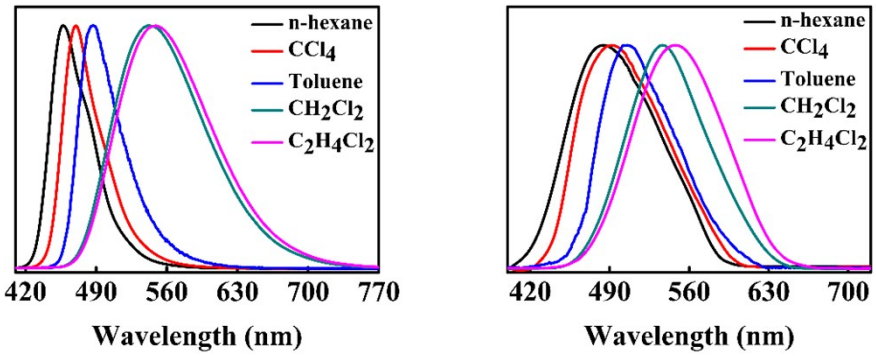


**Figure S12**. Normalized emission spectra of **$L^1$** and **$L^2$** in various solvents.

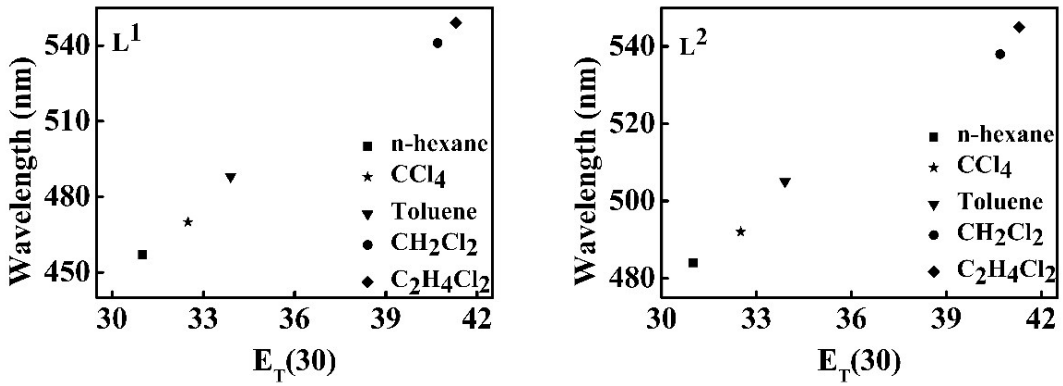


**Figure S13.** Variation of the emission wavelength maximum for $L^1$ and $L^2$ as a function of Reichardt's empirical solvent polarity parameters $E_T(30)$.

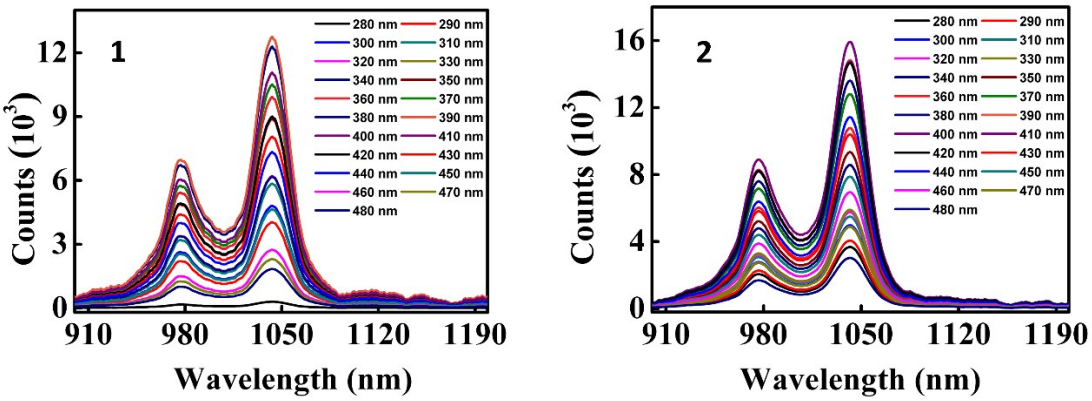


**Figure S14**. Wavelength dependent emission spectra of complexes **1** and **2**.

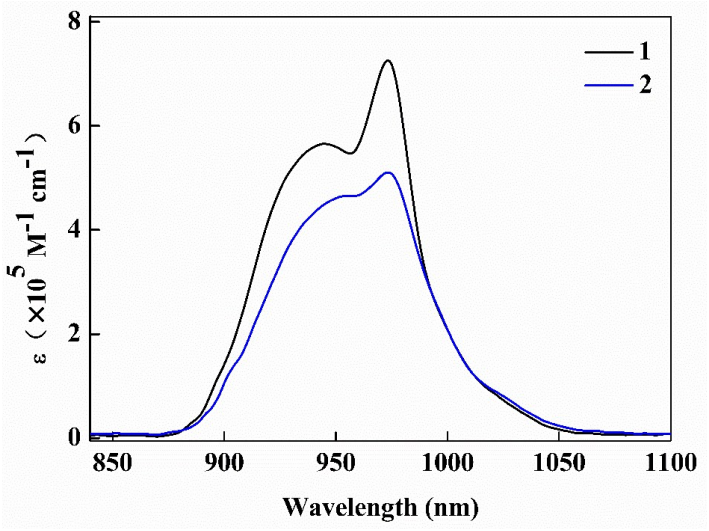


**Figure S15.** Near-infrared spectra of f–f absorption transition for **1** and **2** in $CH_3CN$.

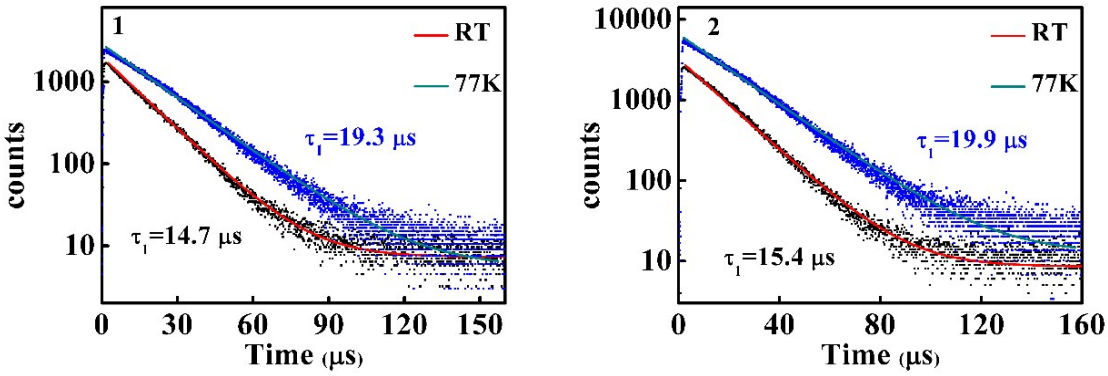


**Figure S16.** Luminescence decay curves of **1** and **2** in $CH_3CN$ monitored at 1042 nm.

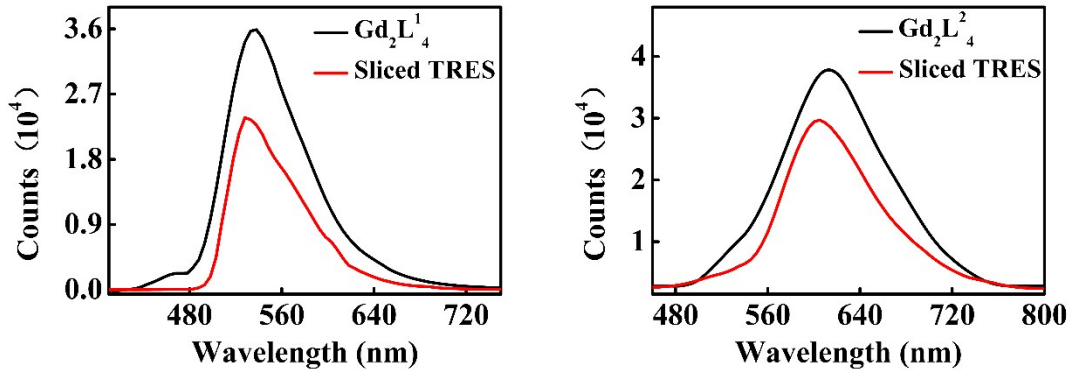


**Figure S17.** Emission spectra of $Gd_2L_4$ (black) at 77 K and time delay (100 μs) in $CH_3CN$.

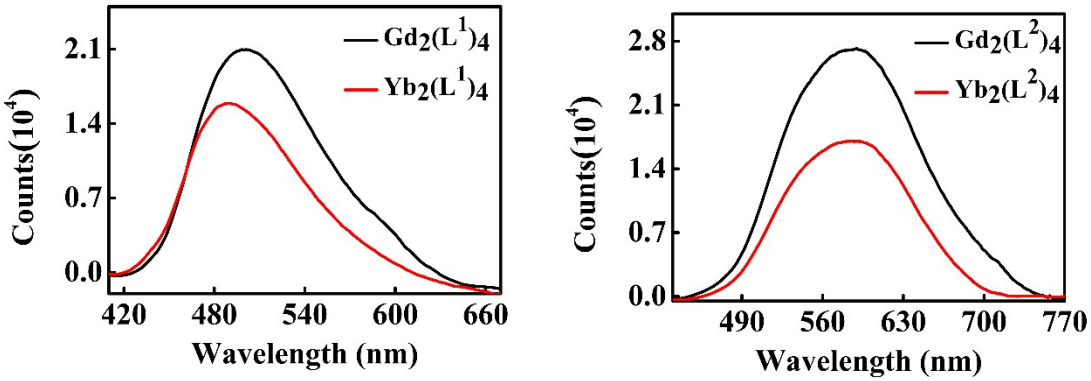


**Figure S18.** Emission spectra of $Gd_2L_4$ (black) and $Yb_2L_4$ (red) in $CH_3CN$ at room temperature.