Electronic Supplementary Material (ESI) for New Journal of Chemistry


# Electronic Supplementary Information

## Supramolecular Luminescent Hydrogels Based on β-Amino Acid and Lanthanide Ions Obtained by Self-Assembled Hydrothermal Reactions

Fausthon Fred da Silva [a], Fernanda Lira de Menezes [a], Leonis Lourenço da Luz [a], Severino Alves Jr

### Experimental Section

*Preparation of the hydrogels*: The G-Eu 97893332 was obtained by mixing 0.15 mmol of $Eu_2O_3$ and a solution 0.9 mmol/L of iminodiacetic acid with pH =5 (by addition of NaOH) in a beaker with magnetic stirring for 20 minutes. The suspension was transferred to a Teflon-lined recipient, sealed in a metallic reactor, heated to 120ºC for six days, and then cooled to room temperature. The same procedure was used to obtain the G-Gd and G-Tb hydrogels, exceptGd$_2$O$_3$ and $Tb_2O_3$, respectively, replaced the europium oxide. The lanthanide-mixed gel (G-$Tb_{0.5}Eu_{0.5}$) was obtained using the same procedure, but started from 0.075 mmol of each lanthanide oxide.

*Physical measurements*: The SEM images and EDS spectra of the solid samples were obtained using a Shimadzu SS550 microscope with a tungsten filament. The IR spectra were performed in a Bruker FT-IR model IFS66 spectrometer. The thermogravimetric analyses were obtained under $N_2$ atmosphere in a Shimadzu TGA 60-H. The luminescence analysis was carried out in a modular spectrofluorometer Horiba Jobin-Yvon Fluorolog-3 with double excitation using a 450 W xenon lamp.

**Table S1.**Elemental analysis of the dried samples.

| | Carbon (%) | Hydrogen (%) | Nitrogen (%) |
|---|---|---|---|
| $[EuNa(HIDA)_2(OH)_2(H_2O)_2]$ | 19.28 | 3.62 | 5.62 |
| Experimental | 20.06 | 4.45 | 5.69 |
| $[TbNa(HIDA)_2(OH)_2(H_2O)_2]$ | 19.01 | 3.56 | 5.54 |
| Experimental | 19.82 | 4.45 | 5.68 |
| $[GdNa(HIDA)_2(OH)_2(H_2O)_2]$ | 19.08 | 3.58 | 5.56 |
| Experimental | 19.28 | 4.17 | 5.49 |

**Table S2.** Experimental intensity parameters, decay rates, lifetime, and quantum efficiency of the G-Eu gel

| $\Omega_2$ ($x10^{-20}$ $cm^2$) | $\Omega_4$ ($x10^{-20}$ $cm^2$) | $A_{RAD}$ ($s^{-1}$) | $A_{NRAD}$ ($s^{-1}$) | $\tau$ (ms) | $\eta$ (%) |
|---|---|---|---|---|---|
| 5.25 | 4.97 | 322 | 3126 | 0.29 | 9.3 |

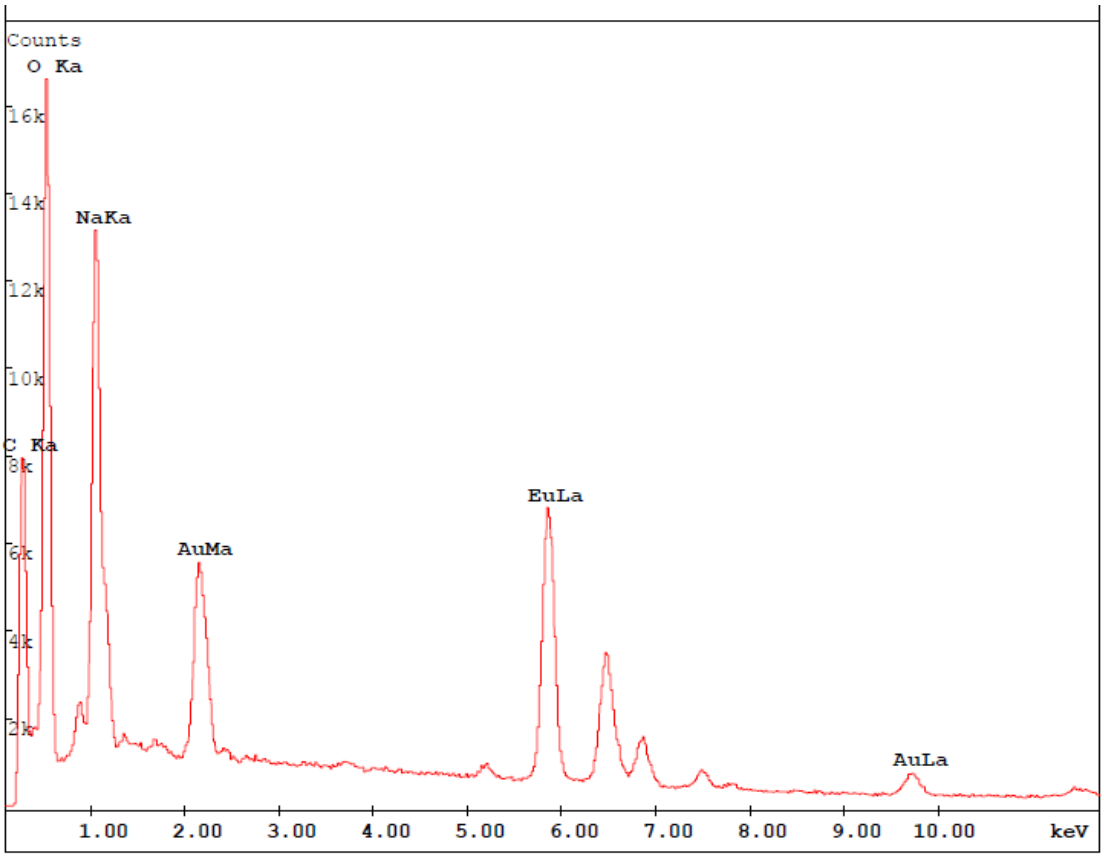


**Figure S1.** EDS spectra of dried G-Eu.

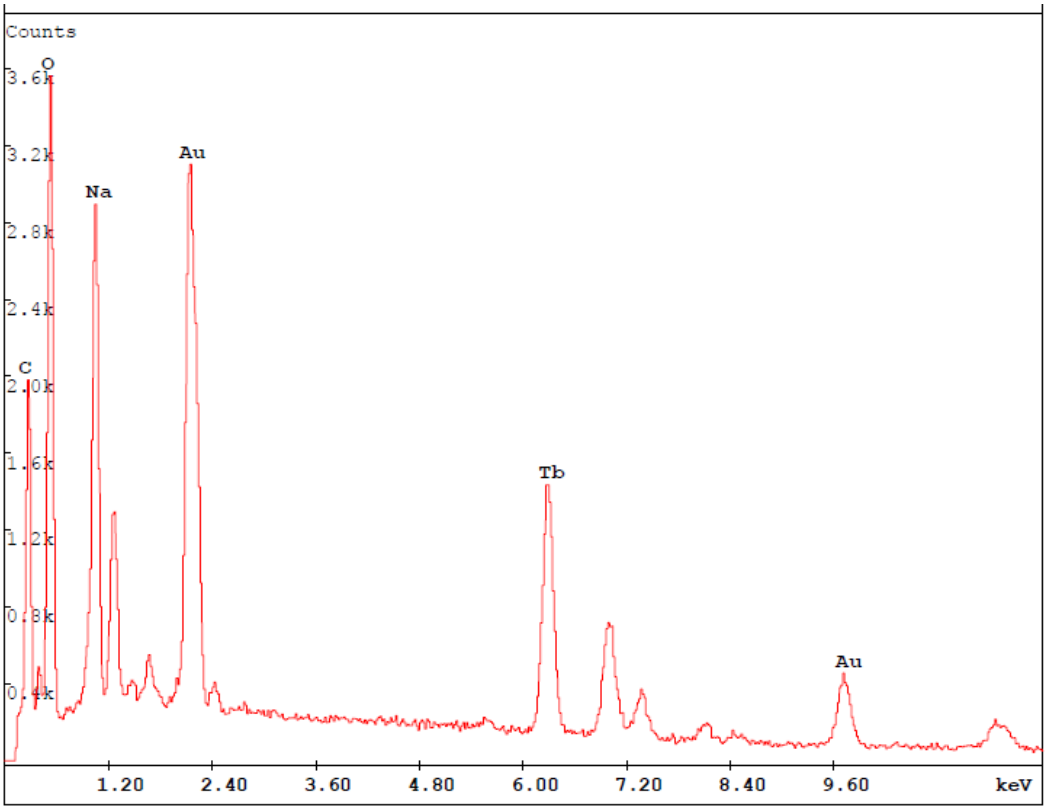


**Figure S2.** EDS spectra of dried G-Tb.

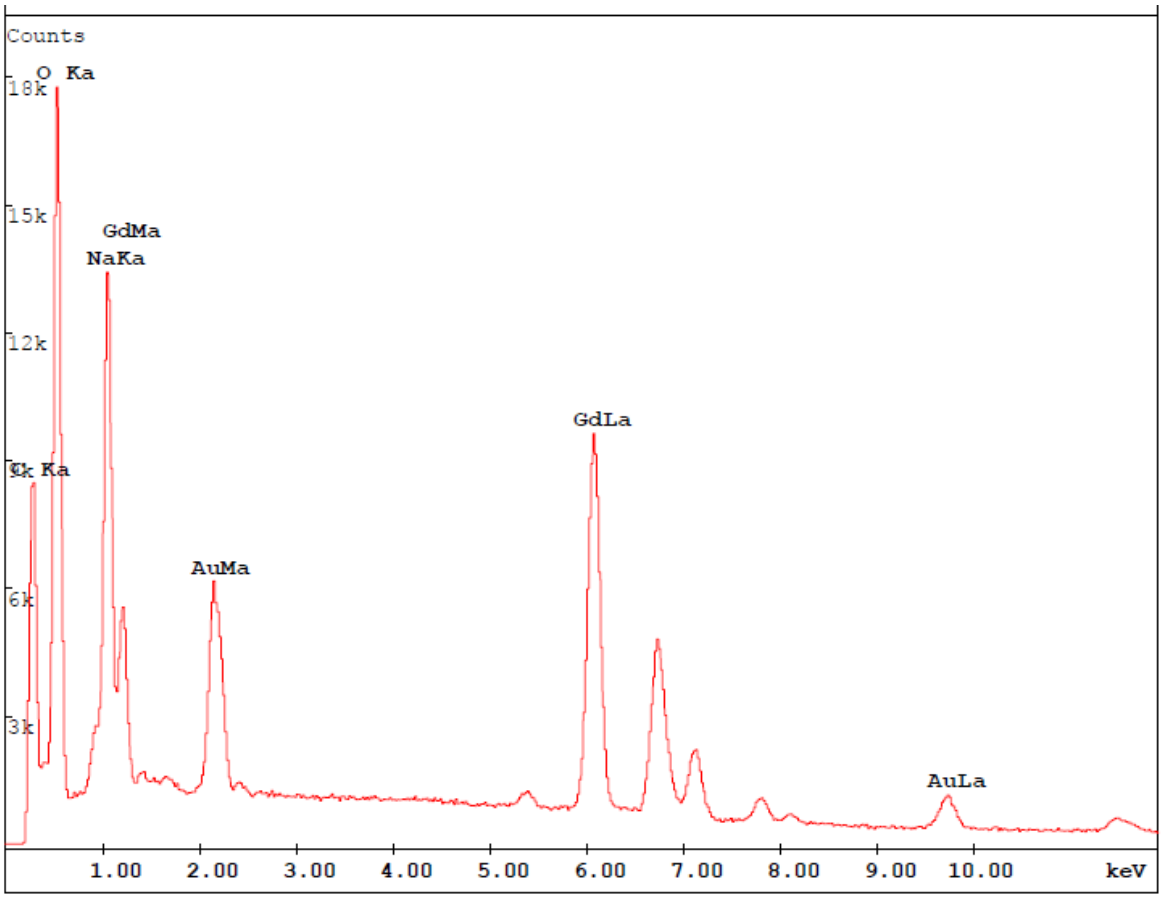


**Figure S3.** EDS spectra of dried G-Gd.

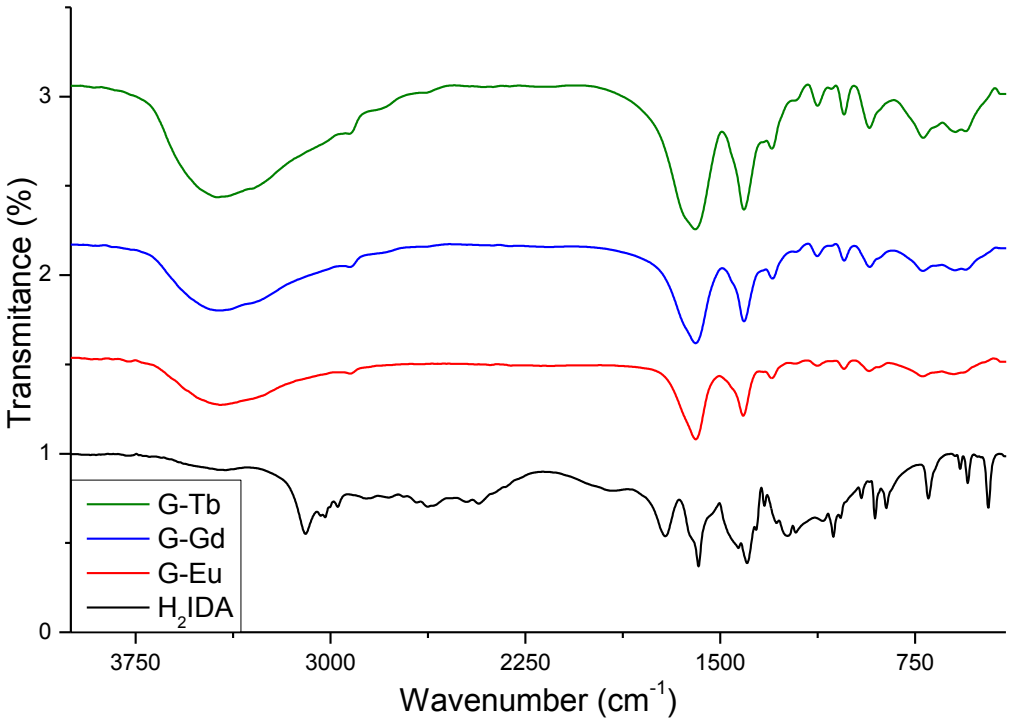


**Figure S4.** IR spectra of the dried samples.

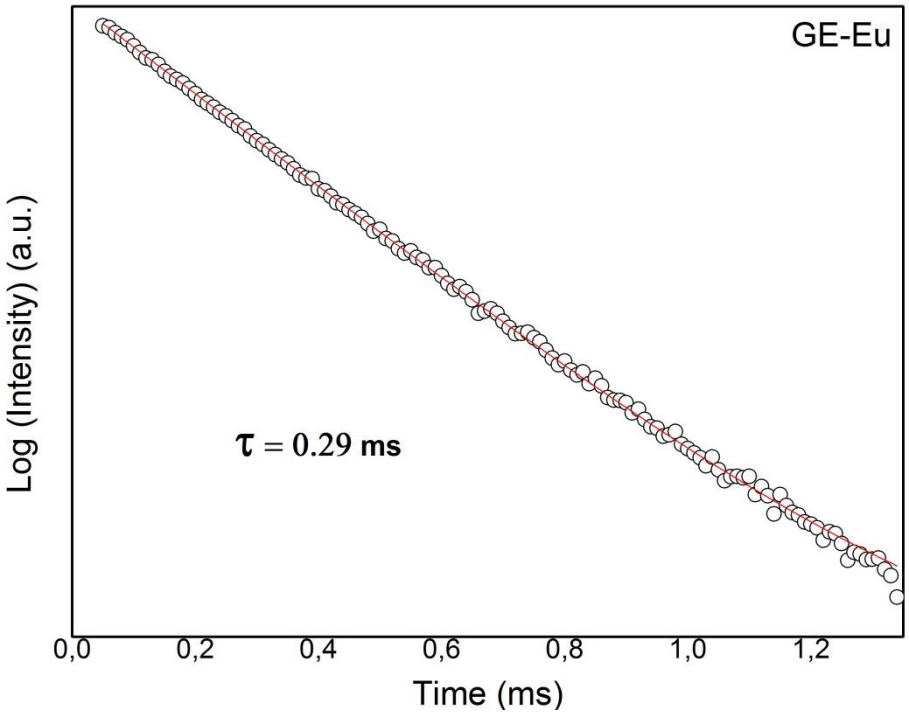


**Figure S5.** Luminescence decay for G-Eu.

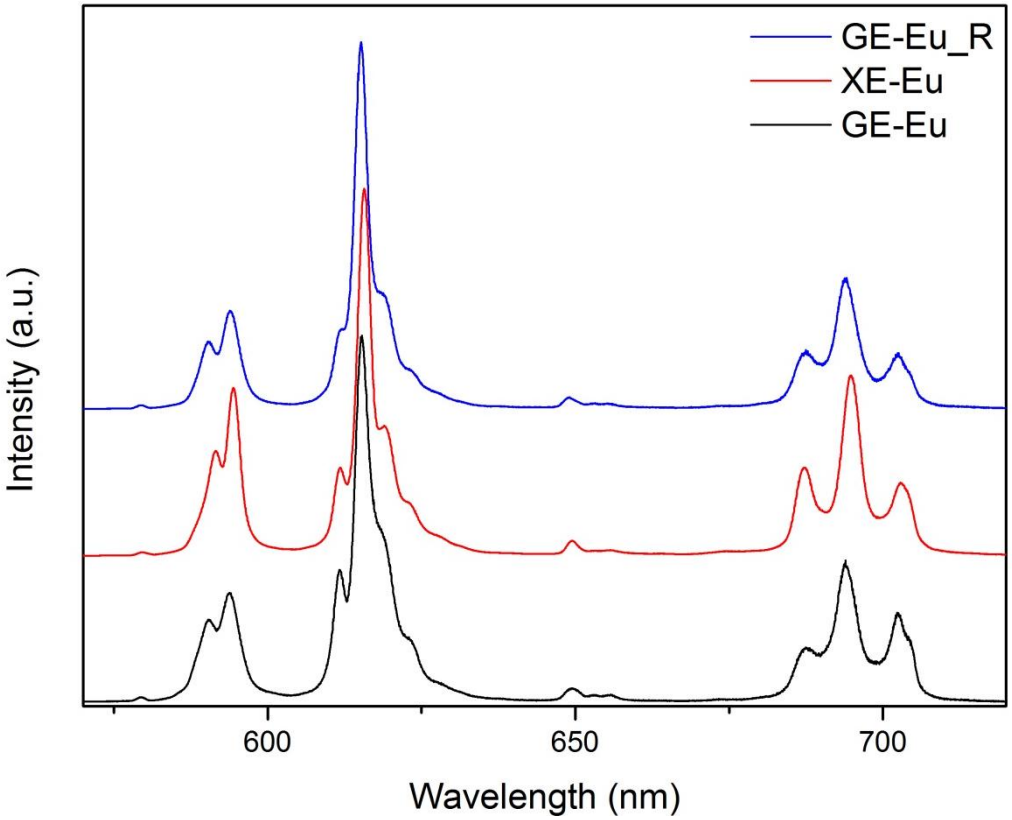


**Figure S6.** Emission spectra of the G-Eu (black), dried sample (red), and rehydrated gel (blue).

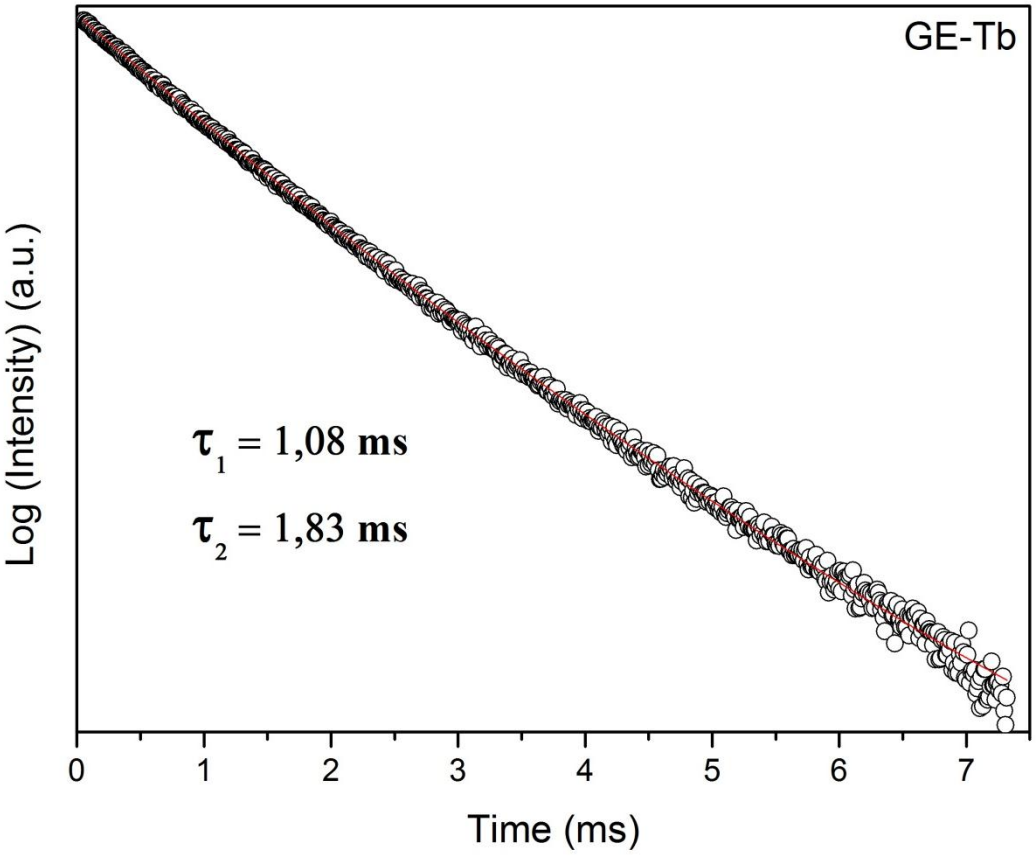


**Figure S7.** Luminescence decay for G-Tb.

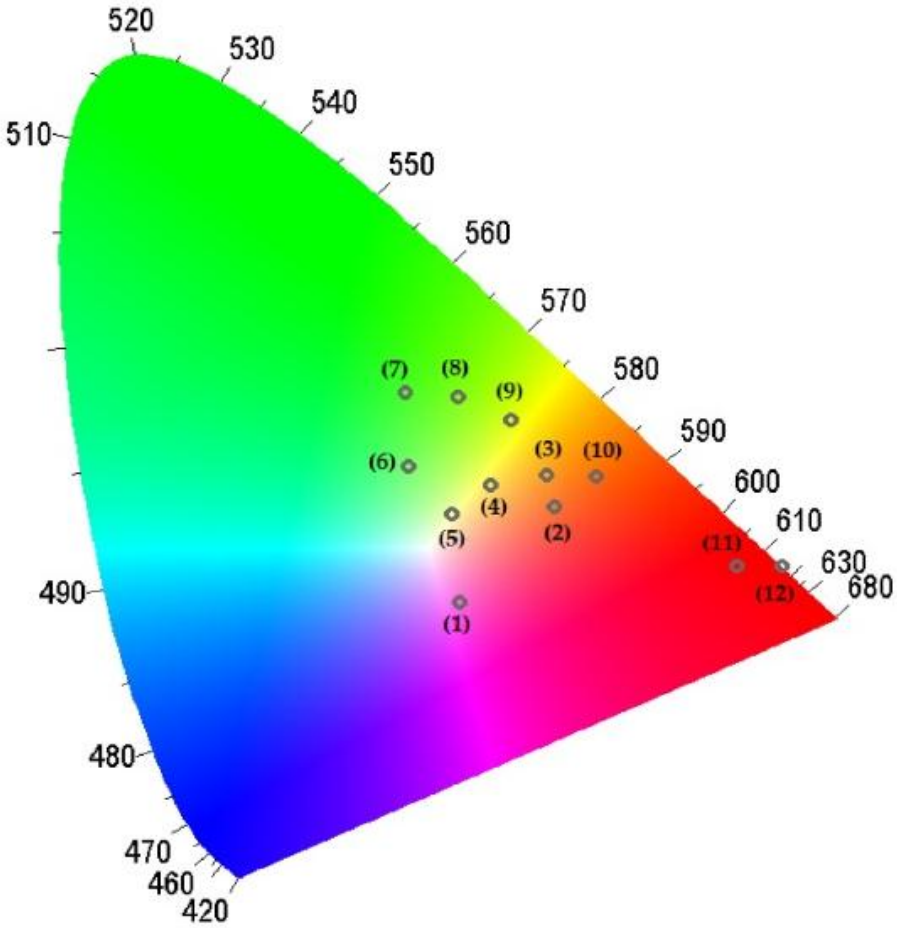


**Figure S8.** The CIE chromaticity diagram: (1) $\lambda_{exc}$= 326 nm; (2) $\lambda_{exc}$= 338nm; (3) $\lambda_{exc}$= 381nm; (4) $\lambda_{exc}$= 395 nm; and corresponding points on the CIE chromaticity diagram.

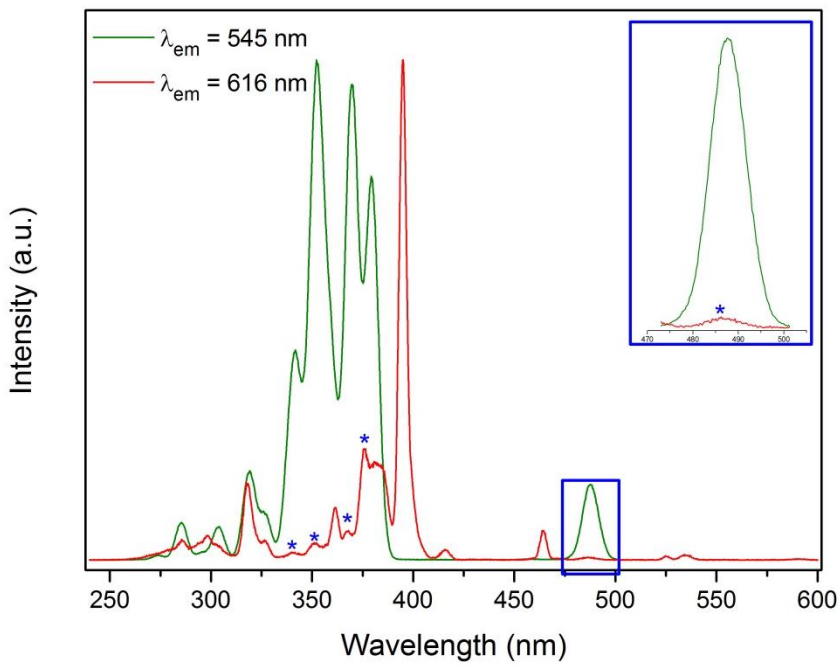


**Figure S9.** Excitation spectrum of the G-$Tb_{0.5}Eu_{0.5}$ gel monitored at 616 nm.

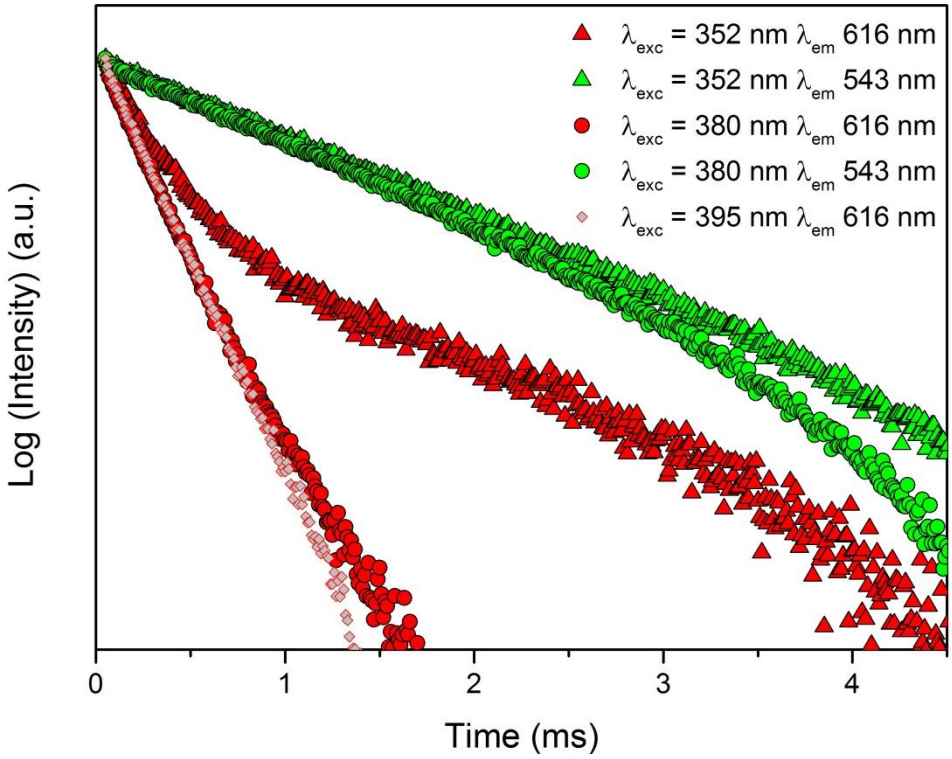


**Figure S10.** Lifetime curves of the G-$Tb_{0.5}Eu_{0.5}$.