Supplemental Information to:

Spectroscopic analysis of Eu^{3+} doped Silica-Titania-Polydimethylsiloxane hybrid ORMOSILs

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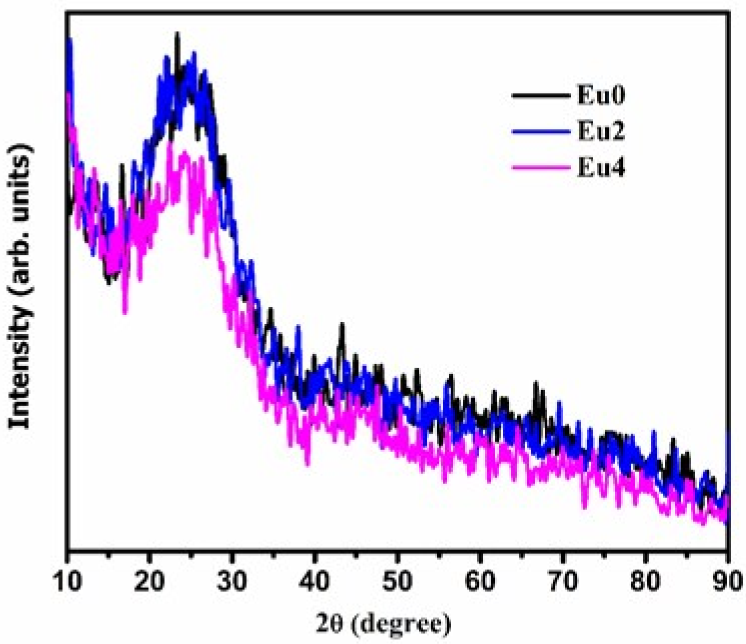

Fig.S1 XRD pattern of pure and Eu^{3+} doped SiO_2-TiO_2-PDMS ORMOSIL samples

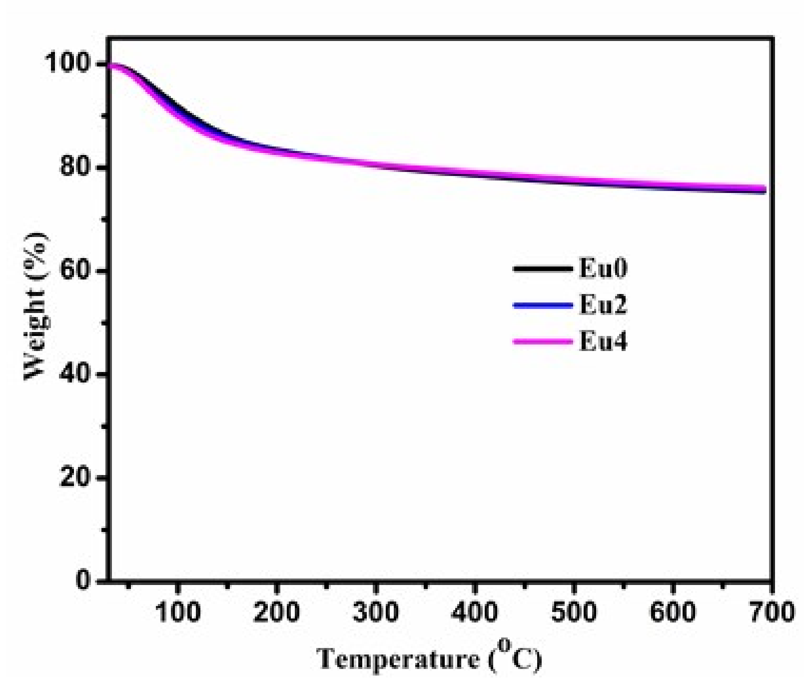

Fig.S2 TG curves of pure and Eu^{3+} doped SiO_2-TiO_2-PDMS ORMOSIL samples

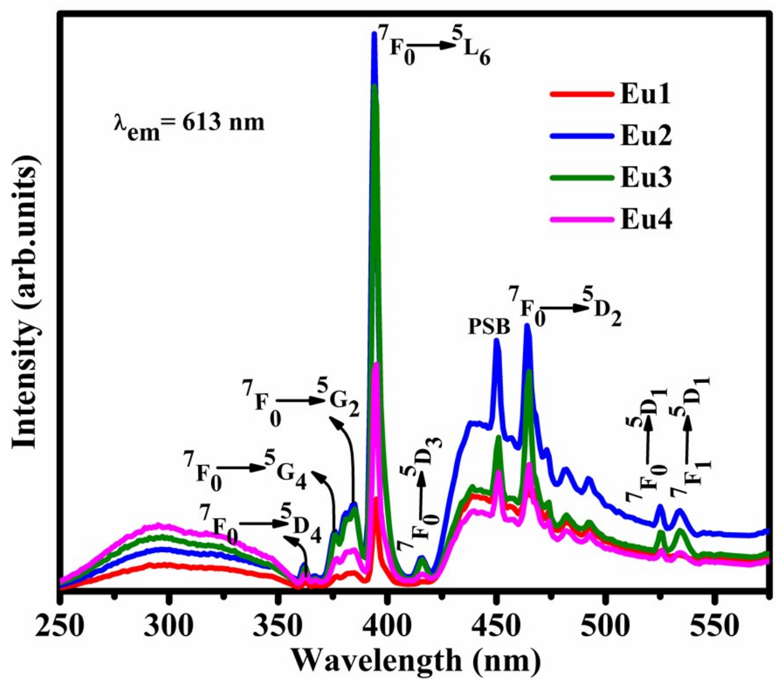

Fig.S3 Excitation spectra of Eu^{3+} doped SiO_2-TiO_2-PDMS ORMOSIL samples

Section S1: The equations and methods of PSB analysis

The rate of multiphonon relaxation from the excited $^5L_6$ level to the lowest excited state, $^5D_0$ is given by

$$W_{mp} = W_0 e^{-\alpha \Delta E} \quad \rightarrow (1)$$

where W_0 is the experimental parameter corresponding to the decay rate at zero phonon emission. 'α' is a host dependent parameter and is given by

$$\alpha = (\hbar\omega)^{-1}\left[\ln\left(\frac{p}{g(n+1)}\right) - 1\right] \quad \rightarrow (2)$$

Here, p is the phonon number, n is the Planck's distribution function and g is the electron – phonon coupling strength which is estimated to be the ratio between the intensity of pure electronic transition (PET) and phonon side band (PSB).

Also, $p = \frac{\Delta E}{\hbar\omega}$ → (3) and

$$n = (e^{\hbar\omega/kT} - 1)^{-1} \rightarrow (4)$$

ΔE is the energy gap between the lowest excited state $^5D_0$ and the higher excited levels $^5D_1$, $^5D_2$ and $^5D_3$ which is approximated as 1750, 2500 and 2800 cm^{-1}.

Section S2: The equations used to calculate the radiative parameters

The JO intensity parameters, Ω_λ (λ= 2, 4, 6) can be used to calculate the important radiative parameters such as transition probability (A) , radiative life time (τ_R) and branching ratio (β_R) for the emission transitions of Eu^{3+} doped glasses.

The transition probability for the transition $\psi_J \longrightarrow \psi'_{J'}$ is given by

$$A(\psi_J, \psi'_{J'}) = A_{ed} + A_{md} \longrightarrow (1)$$

$$= \left[\frac{64\pi^4\nu^3}{3h(2J'+1)}\right]\left[\frac{n(n^2+2)^2}{9}\right]S_{ed} + \left[\frac{64\pi^4\nu^3}{3h(2J+1)}\right]S_{md} \longrightarrow (2)$$

Thus the total transition probability can be calculated using

$$A_T(\psi_J) = \sum_{\psi_J}^{\psi'_{J'}} A(\psi_J, \psi'_{J'}) \longrightarrow (3)$$

But the radiative lifetime of an excited state is related to the total transition probability and is given by

$$\tau_R(\psi_J) = [A_T(\psi_J)]^{-1} \longrightarrow (4)$$

Also the fluorescent branching ratio $\beta_R(\psi_J, \psi'_{J'})$ for a transition from the excited state $\psi'_{J'}$ to the lower state ψ_J is given by

$$\beta_R(\psi_J, \psi'_{J'}) = \frac{A(\psi_J, \psi'_{J'})}{A_T(\psi_J)} \longrightarrow (5)$$

and the branching ratio also helps to predict the radiative intensities of all the emission bands originating from the given excited state.