Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information for

Single-Phase White-Emitting Phosphors Based on Apatite-Type Gadolinium Silicate, $Gd_{9.33}(SiO_4)_6O_2$ Doped with Dy^{3+}, Eu^{3+} and Tb^{3+}

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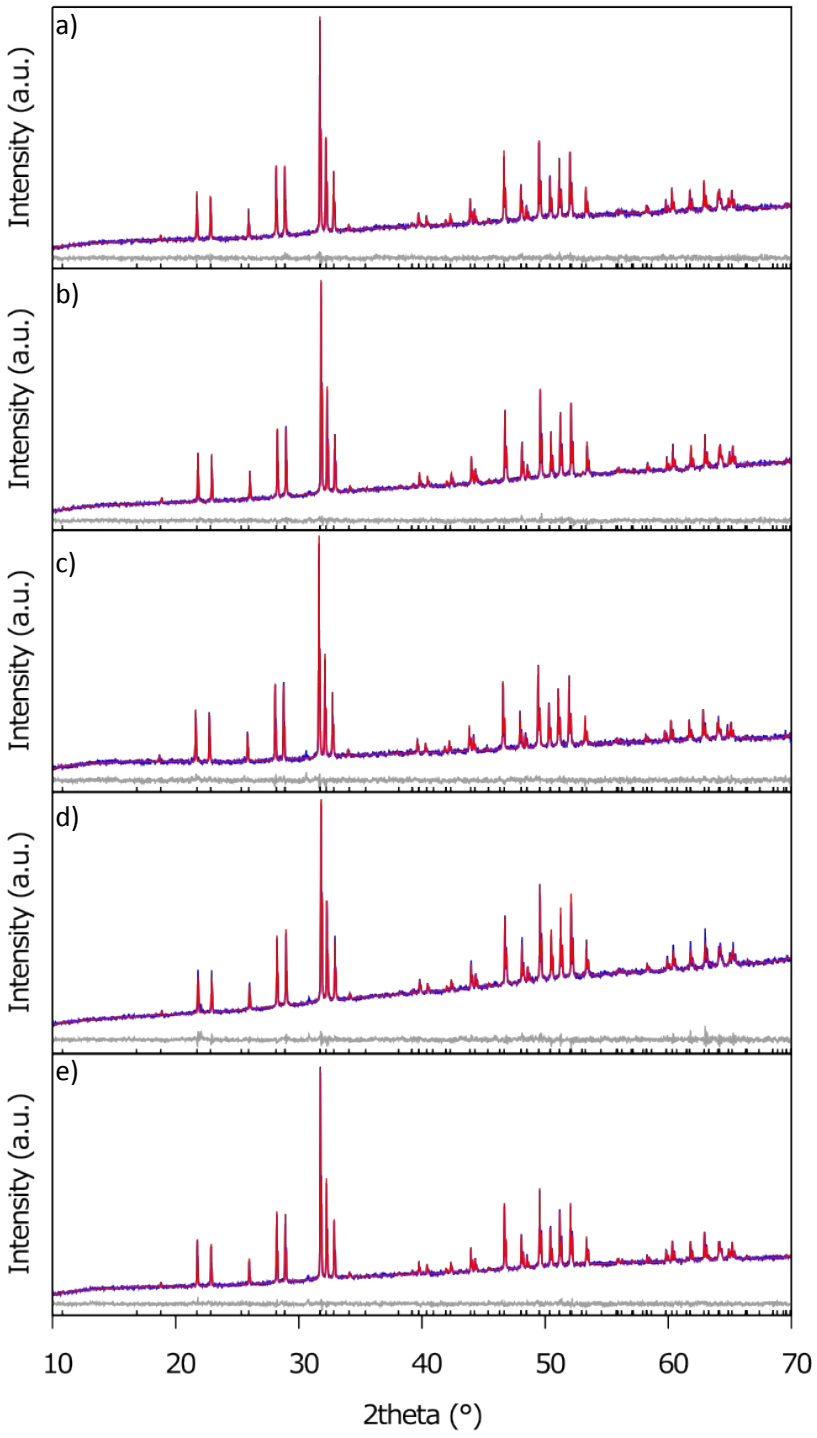

Fig. S1: Rietveld fits for laboratory data for 0.02% Eu: a)1%Dy, b)2%Dy, c)3%Dy, 0.05%Eu: d)2%Dy and e)3%Dy co-doped $Gd_{9.33}(SiO_4)_6O_2$.

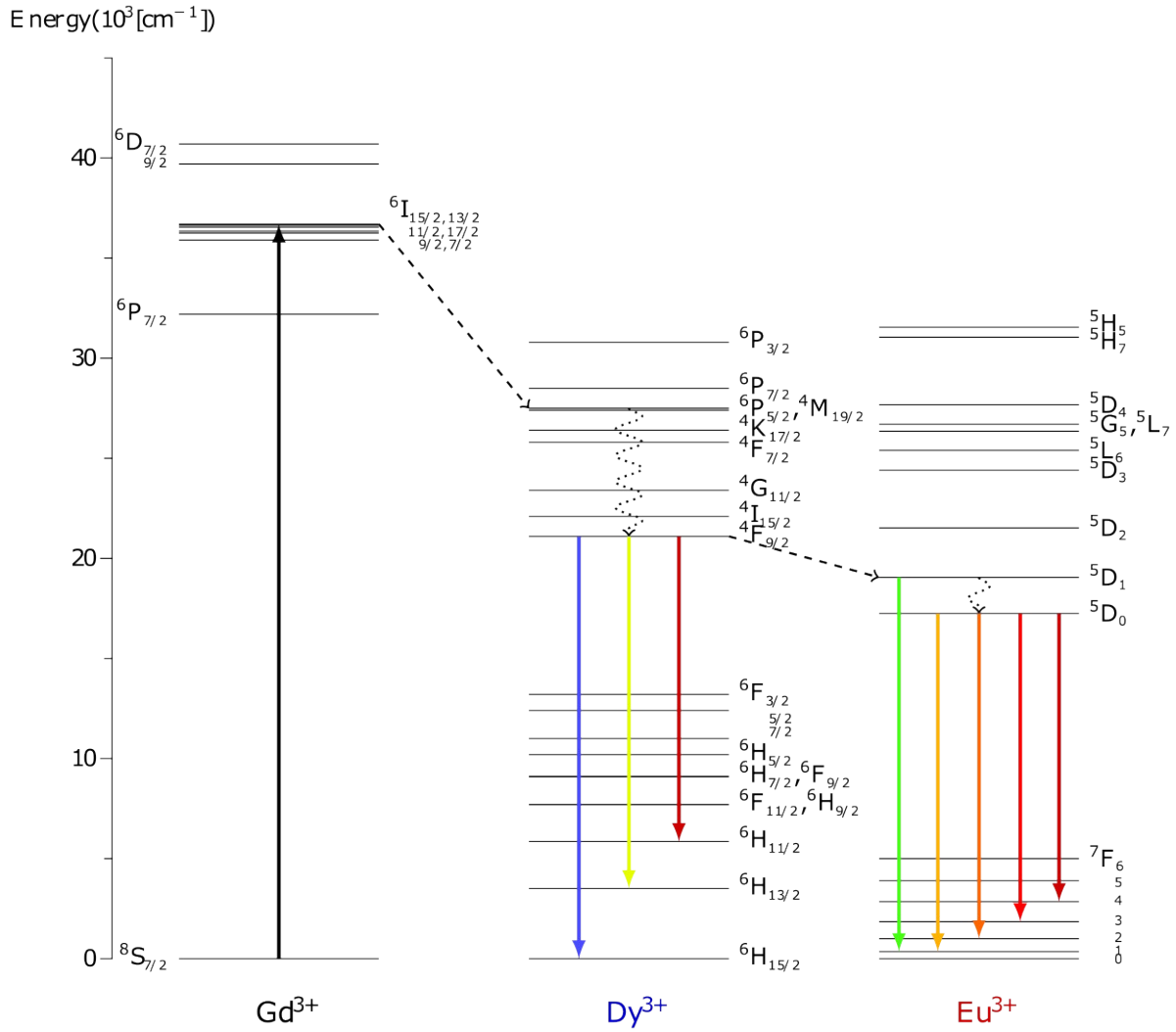

Fig. S2: Energy-level diagrams for Gd^{3+}, Dy^{3+} and Eu^{3+} ions showing the relevant transitions in the system.

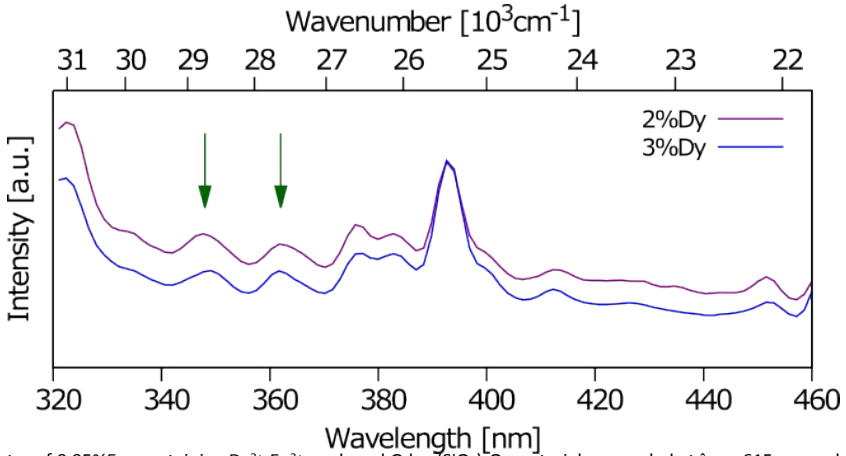

Fig. S3: Excitation spectra of 0.05%Eu- containing Dy^{3+}, Eu^{3+} co-doped $Gd_{9.33}(SiO_4)_6O_2$ materials, recorded at λ_{em} =615 nm and normalised to the 390 nm peak. Green arrows show the Dy^{3+} excitation bands.

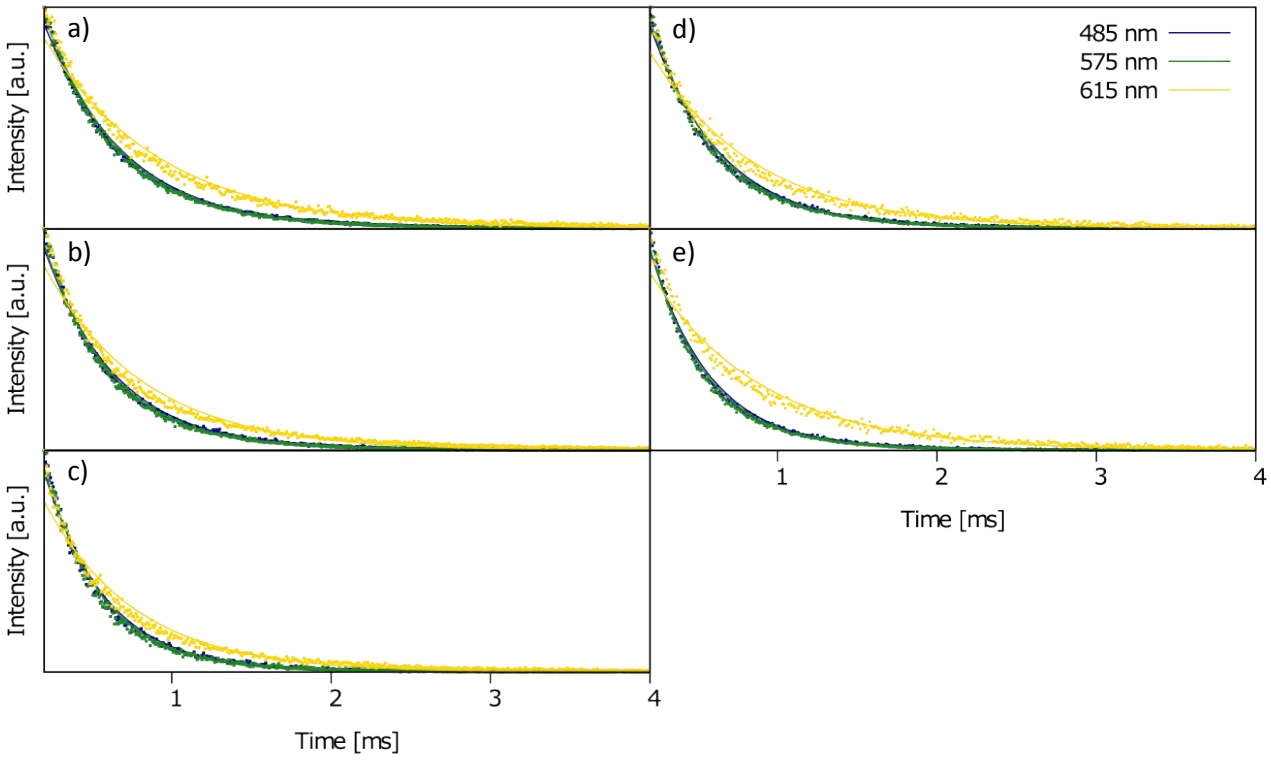

Fig. S4: Decay curves fitted (solid line) of the experimental data (dots) of $^4F_{9/2} \rightarrow {}^6H_{15/2}$ transition at 485 nm, $^4F_{9/2} \rightarrow {}^6H_{13/2}$ transition at 575 nm and $^5D_0 \rightarrow {}^7F_2$ transition at 615 nm for 0.02% Eu: a)1%Dy, b)2%Dy, c)3%Dy, 0.05%Eu: d)2%Dy and e)3%Dy co-doped $Gd_{9.33}(SiO_4)_6O_2$ phosphors, recorded after excitation at 375 nm.

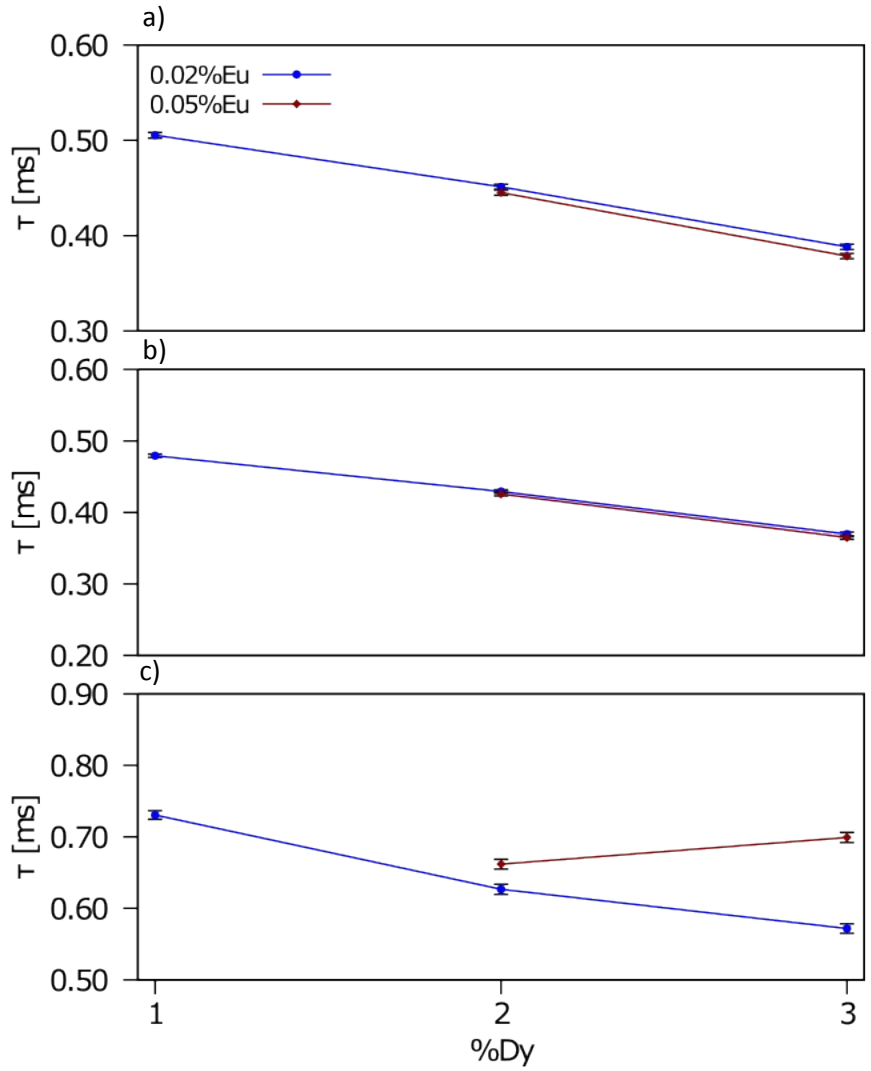

Fig. S5: Average lifetime values dependence Dy^{3+} content for a) $^4F_{9/2} \rightarrow {}^6H_{15/2}$ transition (485 nm), b) $^4F_{9/2} \rightarrow {}^6H_{13/2}$ transition (575 nm) and c) $^5D_0 \rightarrow {}^7F_2$ transition (615 nm).

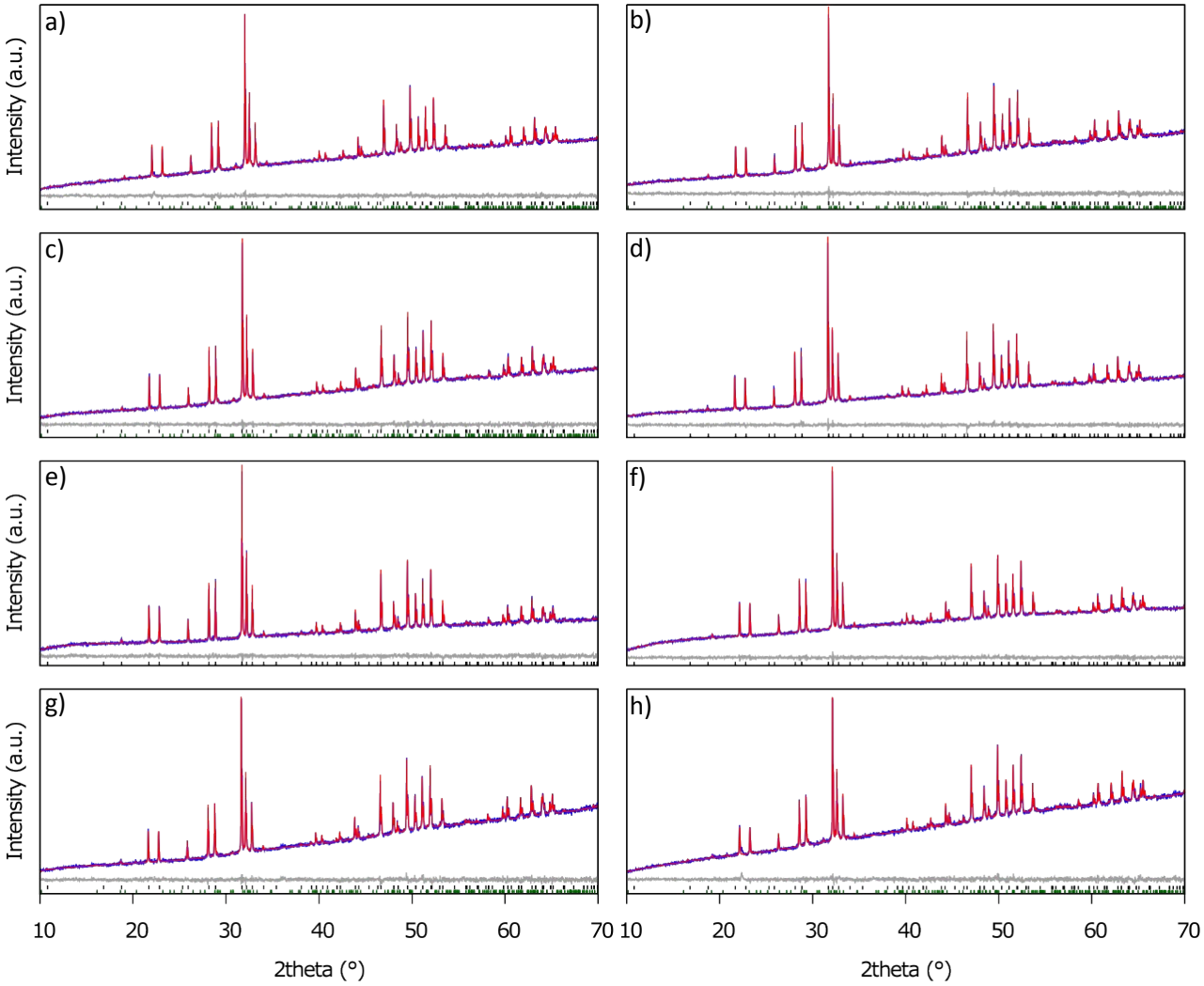

Fig. S6: Rietveld refinements for laboratory data for 0.02%Eu: a)0.3%Tb, b)0.4%Tb, c)0.5%Tb, 0.03%Eu: d)0.3%Tb, e)0.4%Tb, f)0.5%Tb, 0.05%Eu: g)0.3%Tb, h)0.5%Tb co-doped $Gd_{9.33}(SiO_4)_6O_2$.

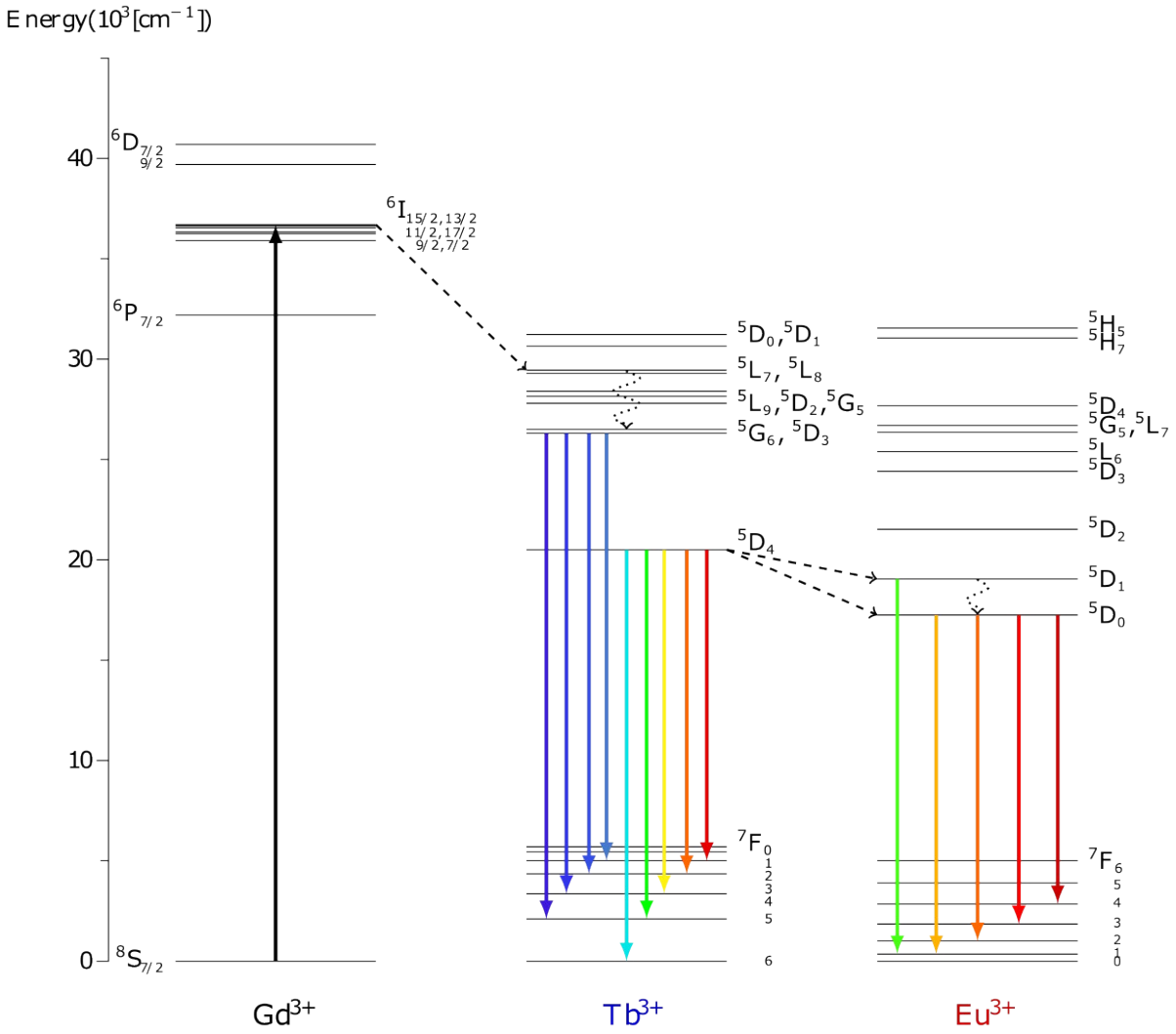

Fig. S7: Energy-level diagrams for Gd^{3+}, Tb^{3+} and Eu^{3+} ions showing the relevant transitions in the system.

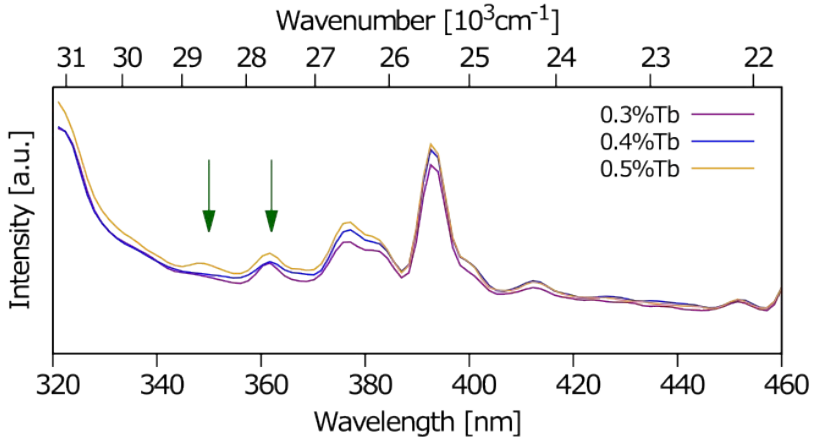

Fig. S8: Excitation spectra of 0.03%Eu- containing Tb^{3+}, Eu^{3+} co-doped $Gd_{9.33}(SiO_4)_6O_2$ materials, recorded at λ_{em} =615 nm and normalised to the 390 nm peak. Green arrows show the Tb^{3+} excitation bands.

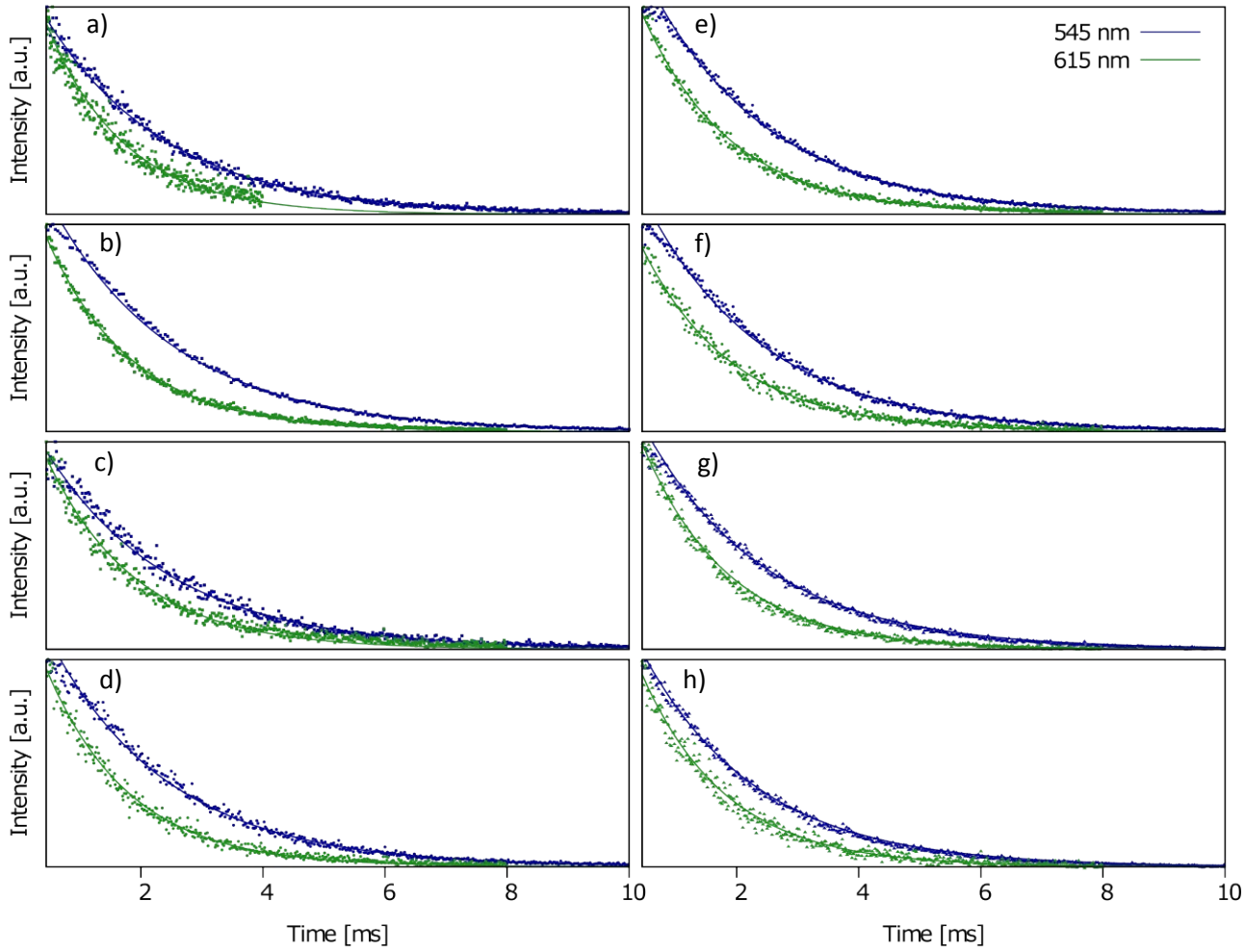

Fig. S9: Decay curves fitted (solid line) of the experimental data (dots) of $^5D_4 \rightarrow {}^7F_5$ transition at 545 nm and $^5D_0 \rightarrow {}^7F_2$ transition at 615 nm for 0.02%Eu: a)0.3%Tb, b)0.4%Tb, c)0.5%Tb, 0.03%Eu: d)0.3%Tb, e)0.4%Tb, f)0.5%Tb, 0.05%Eu: g)0.3%Tb, h)0.5%Tb co-doped $Gd_{9.33}(SiO_4)_6O_2$ phosphors, recorded after excitation at 375 nm.

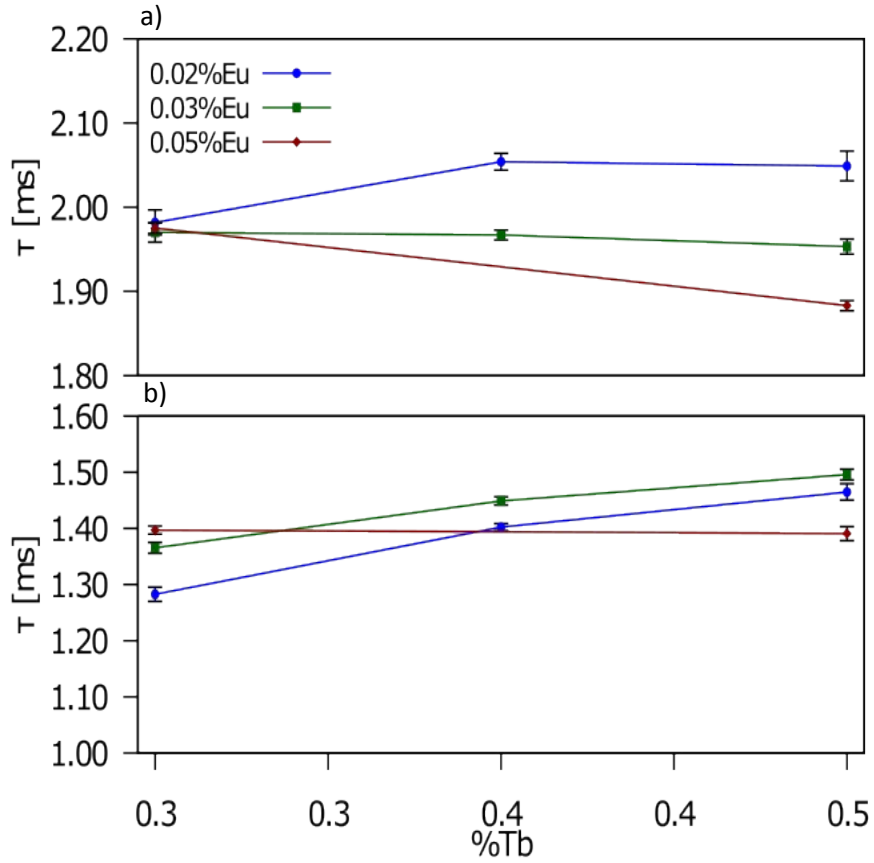

Fig. S10: Lifetime values dependence Tb^{3+} content for a) $^5D_4 \rightarrow {}^7F_5$ transition (545 nm), b) $^5D_0 \rightarrow {}^7F_2$ transition (615 nm).

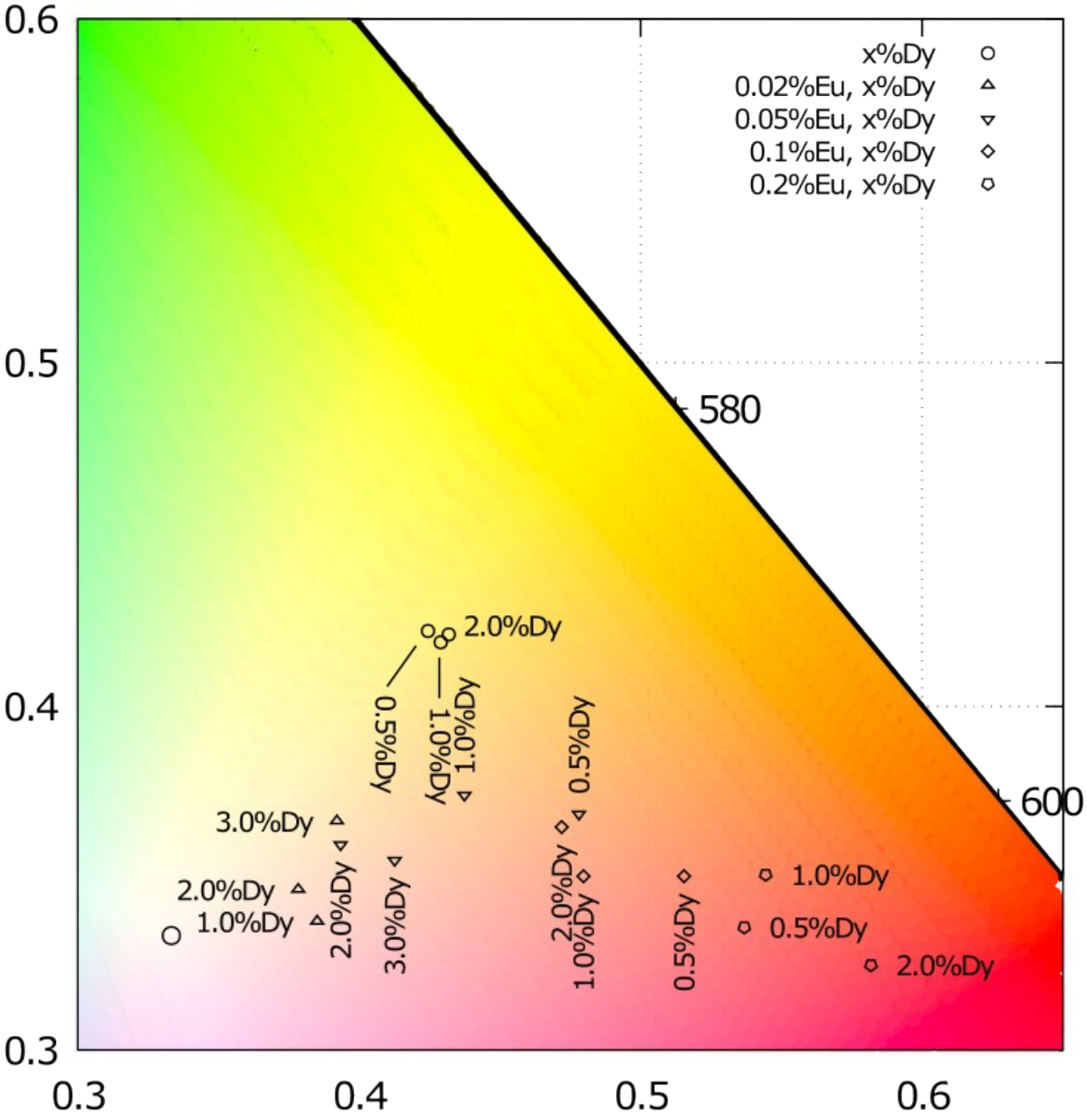

Fig. S11: The 1931 CIE chromaticity diagram showing the chromaticity coordinates at λ_{exc} = 273 nm for Dy-doped host

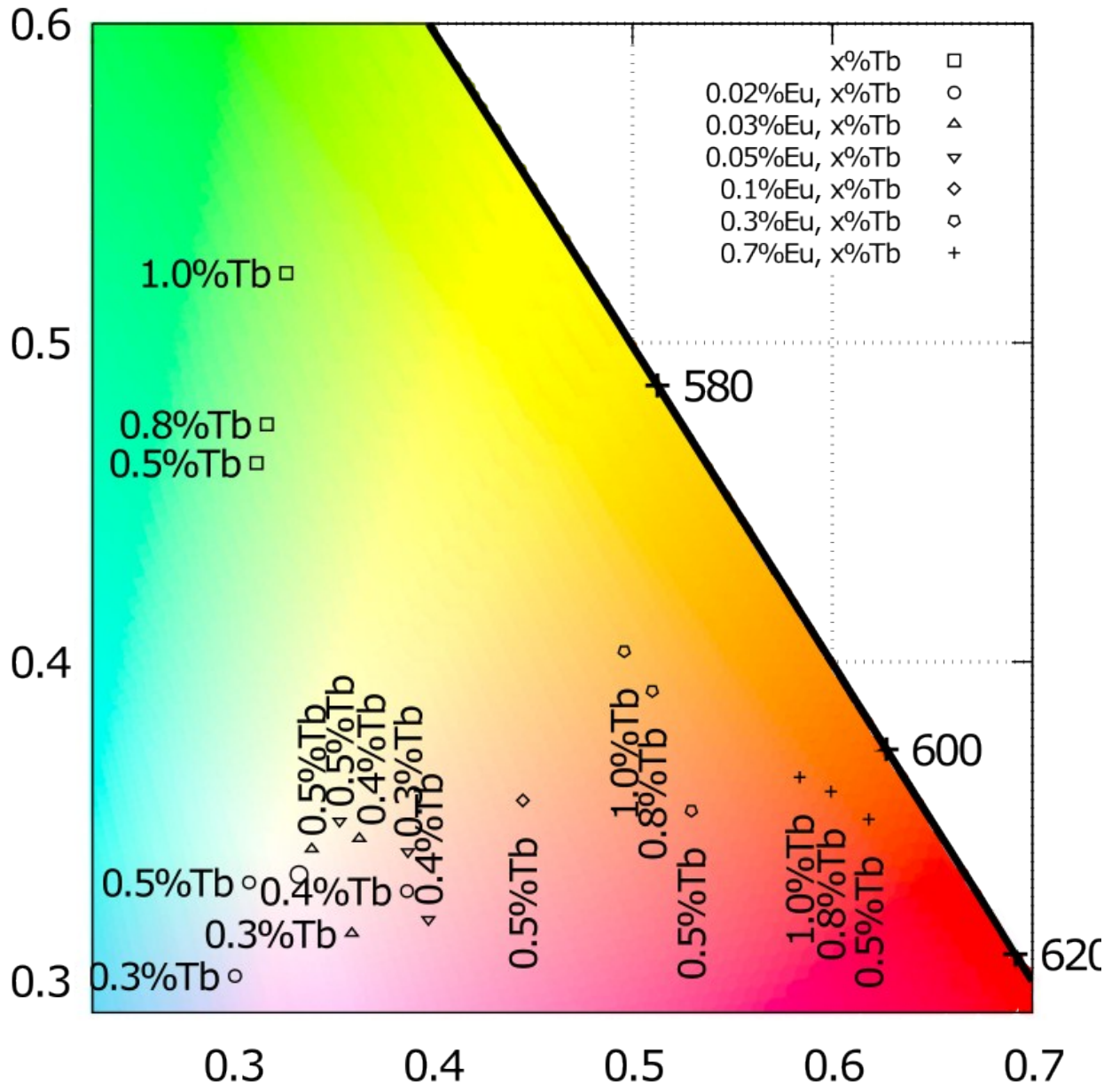

Fig. S12: The 1931 CIE chromaticity diagram showing the chromaticity coordinates at λ_{exc} = 273 nm for Tb-doped host