# Discovering new colors of luminescence in $CaTiO_3$ with rare-earths doped through co-doping

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The luminescence of $CaTiO_3$:Pr has been known since mid-90s [1, 2] and its persistent luminescence has been explained *via* InterValence Charge Transfer transitions. However, the trivalent dysprosium doped materials besides presenting white luminescence does not present any persistent luminescence. On the other hand, the expected red emission on materials doped with $Eu^{3+}$ only occur when exciting in the forbidden $4f^6$-$4f^6$ transitions. The objectives of this work are to show the synthesis and luminescence proprieties of $CaTiO_3$:$Dy^{3+}$ and $CaTiO_3$:$Dy^{3+}$,$R^{3+}$ prepared with the sol-gel method [3, 4]. The excitation spectra of single $Eu^{3+}$ or $Dy^{3+}$ doped materials (Fig. left) show for $Eu^{3+}$, only the $4f^6$-$4f^6$ transitions while for $Dy^{3+}$ both the $4f^9$-$4f^9$ transitions as well as the $O^{2-}\rightarrow Ti^{IV}$ charge transfer and the host absorption. The excitation spectrum for the Dy-Eu co-doped material monitoring the $Eu^{3+}$ emission at 610 nm exhibit both the $Eu^{3+}$ intraconfigurational transitions as well as the $O^{2-}\rightarrow Ti^{IV}$ charge transfer and the host absorption. This result indicates that there is no direct energy transfer from $Dy^{3+}$ to $Eu^{3+}$, but $Dy^{3+}$ acts as a sensitizer for $Eu^{3+}$ to be excited by host transitions. Based on experimental data the energy level diagram was constructed (Fig. right) showing that $Eu^{3+}$ is deep inside the valence band.

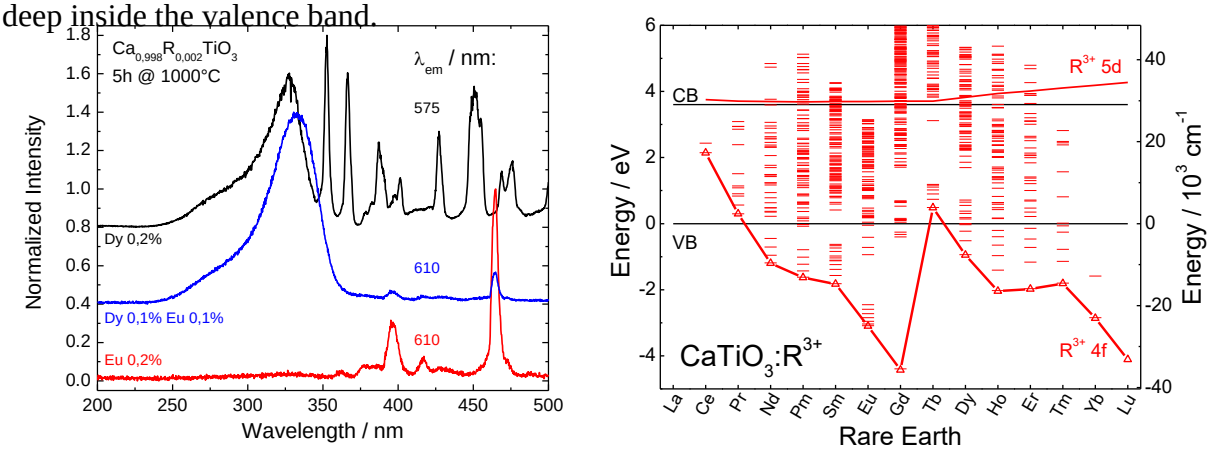


Figure. $CaTiO_3$:$R^{3+}$ excitation spectra (left) and energy levels diagram (right).

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