# Titanium phosphors as a new alternative to rare earth doped materials

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The search of new efficient luminescence materials for application in a variety of fields is becoming very intense nowadays. The luminescence materials, also called phosphors, are present in the modern life in almost every electronic device and illuminated ambient. Specifically for lighting, phosphors such as $Y_3Al_5O_{12}:Ce^{3+}$ are of commercial importance for usage in new cost-effective LED lighting devices. In the persistent luminescence materials, the $SrAl_2O_4:Eu^{2+},Dy^{3+}$ is the benchmark and most commercially used phosphor for emergency lighting and “glow in the dark” devices. However, due to the variable prices of the rare earth oxide precursors it is important to have alternatives and research on the non-rare earth phosphors, based on abundant and easily separable precursors. For this matter, the luminescence arising from the *d*-metals, such as Ti, Mn, and Cr, is in evidence recently. Among these, Ti has many advantages, such as broad and tunable emission band depending on the chemical environment, high abundance, and low cost. Titanium has a very complex electrochemistry and its oxidation state can be +2, +3, and +4. In solid state materials it is possible to find titanium in all these valence states, with $Ti^{2+}$ ($3d^2$) emitting preferentially in the infrared region, $Ti^{3+}$ ($3d^1$) emitting in a wide visible-near infrared range, and $Ti^{IV}$ ($3d^0$) with a characteristic charge transfer emission in oxide hosts. In this work, different Ti doped materials will be compared in terms of the luminescence intensity, emission color, and concentration quenching. The structure and valence of the emitting ion will be studied and correlated with the luminescence properties. Luminescence mechanisms for different oxide and oxysulfides matrix’ are proposed based on experimental data, as well.