Effect of host anion or cation substitution on the luminescence and stability of lanthanum oxide based phosphors doped with bismuth

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Generally, a good host for luminescent ions must exhibit properties such as transparency for visible and infrared light as well as good chemical and structural stability. The stability of the phosphor under the application conditions is an inevitable issue for moving from the laboratory to the industry level and then to the public uses: phosphors which are used in field emissive displays (FEDs) must be stable under the electron beam irradiation, and for the use in photonic applications it must be stable under photon irradiation as well.

The major aim of the research project is to stabilize the La_2O_3:Bi phosphor by adding small amounts of Yittrum (Y) and gallium (Ga) to make $LaYO_3$ and $LaGaO_3$ as well as adding ammonium chloride (NH_4Cl), ammonium bromide ((NH_4Br), ammonium fluoride (NH_4F), and ammonium sulphate $(NH_4)_2SO_4$) to make Lanthanum oxychloride (LaOCl:Bi), Lanthanum oxybromide (LaOBr:Bi), Lanthanum fluoride (LaF_3), Lanthanum oxyfluoride (LaOF) and Lanthanum oxysulphate (La_2O_2S), respectively. The second aim is to encapsulate the La_2O_3 in a polymer for applications, thereby shielding it from the atmosphere. The third aim is to prepare $LaYO_3$:Bi, $LaGaO_3$:Bi, LaOCl:Bi and LaOF:Bi thin films by spin coating and PLD.

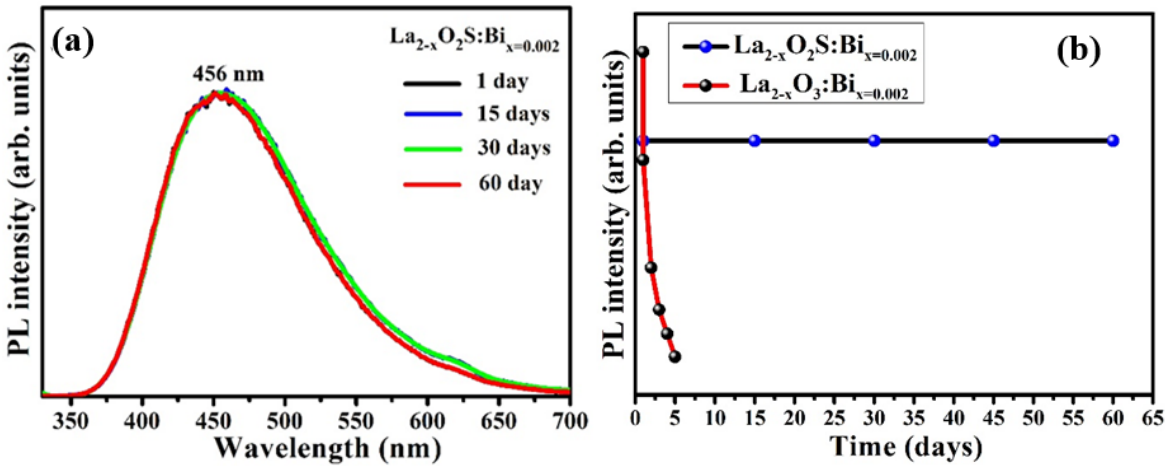

Figure 1: (a) PL emission of $La_{2-x}O_2S:Bi_{x=0.002}$ excited at 260 nm exposed to air for 60 days. (b) PL intensity of $La_{2-x}O_2S:Bi_{x=0.002}$ with time, compared to $La_{2-x}O_3:Bi_{x=0.002}$ which is unstable and shows rapid degradation.