# Structure and luminescent properties of $Dy^{3+}$- doped $Ca_{10-2x}Dy_xLi_x(PO_4)_6O_2$ $(0 \leq x \leq 1)$ oxyapatites for white LEDs application

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Apatites with the general formula $M_{10}(PO_4)_6X_2$(M is a divalent cation and X is a halide) havea considerable flexibility in their elemental composition. The apatite lattice has two sites Ca(I) and Ca(II) available for cations localized in the 4(f) and 6(h) positions, respectively. This study describes the structure and luminescent properties of $Dy^{3+}$doped $Ca_{10-2x}Dy_xLi_x(PO_4)_6O_2$ $(0 \leq x \leq 1)$(CDLPO).The materials were prepared via conventional solid state reaction. The effects of synthesis parameters, $Dy^{3+}$concentration and charge compensator $Li^+$ co-doping on the structural and vibrational properties of samples were investigated.

The structural and morphological studies of the CDLPO phosphors were carried out by X-ray diffraction (XRD), Infrared spectroscopy, Raman scattering spectroscopyand Scanning Electron Microscopy (SEM). Calcium-oxyapatite system shows a common apatite structure and occurs as a continuous solid solution.

According to the $Dy^{3+}$emission spectra, two different cation sites have been identified in this apatite structure. Two emission bands of the $Dy^{3+}$ ion are observed, the blue band (460–500 nm) corresponding to the $^4F_{9/2} \rightarrow {}^6H_{15/2}$ transition and the yellow band (550–600 nm) due to the $^4F^{9/2} \rightarrow {}^6H_{13/2}$ transition. The overlap between the emission band of one site and the excitation band of the other site corresponds to an energy transfer phenomenon.

The intense emission at 572 nm could be potentially used in apatites as a white emitting phosphor. Both blue and yellow emissions would constitute the white light [1]. Correlations between the luminescence results and the structural data are discussed.

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