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## Short-range structure and photoluminescent properties of the $\text{CaTiO}_3\text{:Pr,L a}$ phosphor

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### Abstract

$\text{Pr}^{3+}$ -doped  $\text{CaTiO}_3$  perovskite is a promising phosphor compound with the possibility of use in several technological applications. In this paper, we report the substitution of  $\text{Ca}^{2+}$  ions with  $\text{La}^{3+}$  ions in order to promote Ca vacancies to further enhance photoluminescence (PL).  $\text{CaTiO}_3\text{:Pr,L a}$  samples were prepared by the polymeric precursor method and their short- and long-range structure and photoluminescent properties were investigated in this paper. PL measurements show a narrow emission centered at 612 nm typical of the  $^1\text{D}_2 - ^3\text{H}_4$  transition of  $\text{Pr}^{3+}$  ions. As the La content increases, the intensity of this peak is increased. This enhancement of PL curves for  $\text{CaTiO}_3\text{:Pr,L a}$  samples is associated with disorder in the  $\text{CaTiO}_3$  lattice caused by the La incorporation. This disorder as a function of the La content is shown by both X-ray absorption near edge structure (XANES) spectra at the Ti K-edge and Raman spectroscopy measurements.  $\text{CaTiO}_3\text{:Pr,L a}$  samples do not present PL with long term afterglow.

Keywords:  $\text{CaTiO}_3$ , Calcium titanate, Praseodymium, Lanthanum, photoluminescence, Red phosphor, XANES, Raman, Ca vacancies, Short term afterglow

### 1. Introduction

Luminescent materials, or phosphors, are widely used in several technological applications, such as cathode-ray tubes, light bulbs, lasers, solar concentrators, vacuum fluorescent displays, medical radiology equipment (including scintillators), field emission displays and light-emitting diodes [1-7]. Regarding field emission displays, which are one of the best candidates for advanced flat-panel applications, calcium

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