

A Comparison of Excitation and Emission Properties of  
Pr-doped.  $\text{LiNbO}_3$ ,  $\text{CaNbO}_3$ , and  $\text{CaTiO}_3$   
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Pr-doped powders are being investigated for use as red phosphors in LED-based solid-state lighting applications because of the strong, red, sharp-line praseodymium emission between 610 and 625 nm. The samples used in this research are a  $\text{LiNbO}_3$ :Pr crystal, a  $\text{CaNbO}_3$ :Pr single crystal, and  $\text{CaTiO}_3$ :Pr nano-powders. In all three systems, the  $\text{Pr}^{3+}$  ion exhibits a charge transfer state under excitation in the near UV. The energy of the charge transfer state differs slightly from one system to another. In all three systems under investigation, however, following excitation into the charge transfer state the excitation energy can bypass the blue-emitting  $^3\text{P}_0$  level and relax to the  $^1\text{D}_2$  level of  $\text{Pr}^{3+}$ , from which it emits strongly in the red. We compare the Pr emission and lifetime characteristics under excitation across the bandgap and into the charge transfer state. We present results showing how the luminescence spectra and the response to pulsed excitation depend on the excitation wavelength and on the temperature of the sample. We examine these characteristics between 7K and 500K. The goal of this research is to ascertain if, and under what conditions, the Pr ion can be used as an efficient phosphor under excitation with near UV excitation.