Orange persistent luminescence of Pr^{3+} doped in cadmium silicate.

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Abstract – $CdSiO_3$: Pr^{3+} ceramic powder was thermally treated at 1000 ºC in 5 h. The excitation spectra under emission at 320 nm of the Pr^{3+} ion display a narrow band with maximum around 600 nm. The sample exhibited luminescence afterglow orange emission for 30 seconds after exposure to UV radiation. The influence of the temperature on the structure, coloration, stability and homogeneity were investigated by X-Ray diffraction, infrared spectroscopy and luminescence spectroscopy.

Persistent luminescent materials are part of everyday life, finding large use in applications such as luminous paints, emergency lighting, safe traffic, wall painting, films, artificial fibres, rubbers, textiles ceramics and various articles. Long-lasting phosphorescence, a phenomenon due to the thermal stimulated recombination of holes and electrons at traps, which leave holes or electrons in a long-lived excited state at room temperature, is an interesting phenomenon in which the material persists for a long time after the removal of the excitation source [1,2]. Based on this intrinsic merit, much interest was aroused in various rare earth ion-doped crystals and glasses excited by UV or infrared femtosecond laser, and their applications for luminous glass, emergency signs, watches and graphic arts, etc [3].

This present work is aimed at searching for the orange light-emitting long-lasting phosphors. The introduction of Pr^{3+} ions into the $CdSiO_3$ host produces a highly dense trapping level, which is responsible for the long-lasting phosphorescence at room temperature. It is considered that the long-lasting phosphorescence is due to persistent energy transfer from the electron traps to the Pr^{3+} ions, which creates the persistent luminescence of Pr^{3+} to produce the orange light-emitting long-lasting phosphorescence.

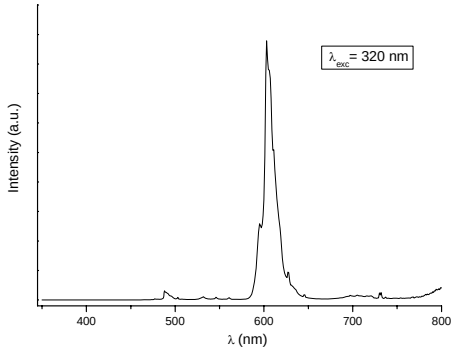

Figure 1: Emission spectrum of the compound

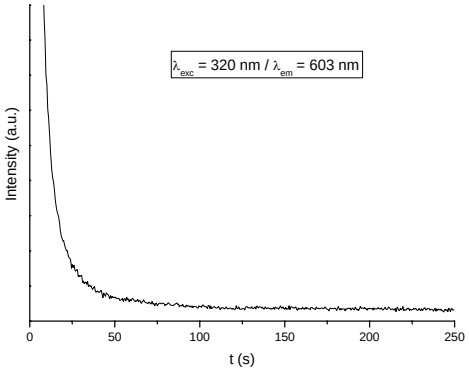

Figure 2: Delay time of compound emission

References

[1] J. Qiu and K. Hirao, *Solid State Commun.* **106** (1998), p. 795.
[2] T. Matsuzawa, Y. Aoki, N. Takeuchi and Y. Murayama, *J. Electrochem. Soc.* **143** (1996), p. 2670.
[3] T. Katsumata, K. Sasajima, T. Nabae, S. Komuro and T. Morikawa, *J. Am. Ceram. Soc.* **81** (1998), p. 413.