Upconversion properties of Pr^{3+} doped $A_3Y(PO_4)_3$ (A=Sr, Ba) phosphors

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The significance of ultraviolet (UV) radiation in scientific research and various industries cannot be overstated. UV-C radiation (100–280 nm) is known for its remarkable effectiveness in destroying a variety of microorganisms [1]. This form of radiation is invaluable for applications such as water treatment, air purification, and surface disinfection in various settings, including healthcare facilities, laboratories, and food processing plants. Over the past decades, researchers have studied a number of new phosphors capable of efficiently converting visible light into UV-C radiation. Using Pr^{3+} as an activator is the most efficient option to generate UVC radiation through excitation with visible light using two-photon processes involving emission from the 4f5d band [2]. Despite the high phonon energy, phosphates hold promise for use as UV phosphors due to their small Stokes shift. In addition, they offer photochemical, chemical and, mechanical stability, radiation resistance, as well as a simple preparation process.

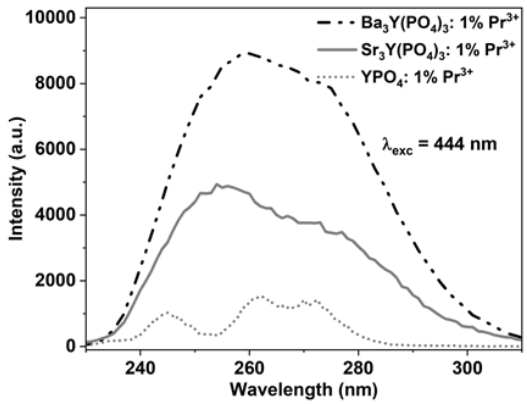

Fig. 1 Upconversion luminescence spectra of $Ba_3Y(PO_4)_3:Pr^{3+}$, $Sr_3Y(PO_4)_3:Pr^{3+}$ and $YPO_4:Pr^{3+}$ crystallites under 444 nm excitation.

In this work, $A_3Y(PO_4)_3:Pr^{3+}$ (A=Ba, Sr) crystallites were synthesized using a solid-state reaction method, and their photoluminescent properties were investigated in detail. Particular emphasis was paid to the study of upconversion in the ultraviolet region using a 444 nm laser as an excitation source. The potential applications of $A_3Y(PO_4)_3:Pr^{3+}$ crystallites as UVC phosphors will be discussed.

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[2] Auzel F. (2004) Chem. Rev., 104, 139–173.

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