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# Suppression of the Slow Scintillation Component in BaF2 Crystals by Y3+ Doping

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It is well known that Barium fluoride (BaF2) crystals have a fast scintillation light peaked at 195 nm and 220 nm with a sub-ns decay time. This ultra-fast scintillation promises its wide application in future HEP experiments requiring extreme fast rate capability, Gigahertz hard X-ray imaging and TOF-PET etc. BaF2 crystals, however, have also a slow scintillation component peaked at 310 nm with a decay time of about 600 ns, which causes a pile-up problem. Two approaches have been proposed to handle the slow scintillation in BaF2: selected readout with optical band pass filters [1] or solar-blind photodetector [1] and selective doping in BaF2 with rare earth (RE), such as Ce, La and Y [2]. Our previous investigation shows a 20 cm long La/Ce doped BaF2 crystal grown in Beijing Glass Research Institute (BGRI) with effective slow component suppression [3]. In this study, we show that Y3+ ion doping has a great potential for slow component suppression in BaF2. Transmission and radio-luminescence spectra, light output, fast/slow ratio, scintillation decay kinetics and light response uniformity are measured for Y3+ doped BaF2 crystals grown in Shanghai Institute of Ceramics (SIC). The results show that the slow scintillation component in BaF2 crystal can be suppressed by up to a factor of 6 by Y3+ doping at 1at%, while the fast component remains almost unaffected. Development will continue along this line of research.

References: [1] D. Stefan, W. N. Rainer, W. Benjamin, et al., J. Phys.: Conf. Ser. 587, 012044 (2015).Ren-Yuan Zhu, Nucl. Instrum. Meth. A 340, 442 (1994).
[2] B.P. Sobolev, E.A. Krivandina, S. E. Derenzo, W.W. Moses and A. C. West, "Suppression of BaF2 Slow Component of X-Ray Luminescence in Nonstoichiometric Ba0.9R0.1F2.1 Crystals (R=Rare Earth Element),"in the Proceedings of The Material Research Society: Scintillator and Phosphor Materials, pp. 277-283, 1994, and reference therein. [3] Fan Yang, Junfeng Chen, Liyuan Zhang and Ren-Yuan Zhu, "Development of BaF2 Crystals for Future HEP Experiments at the Intensity Frontiers", Paper N36-7 in 2016 IEEE NSS/MIC Conference Record.

## Has accepted

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