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Development of Hafnium-Halide-Based Scintillator for Radiation monitor

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A novel halide scintillator with low hygroscopic nature, Cs_2HfCl_6 (CHC), reaching high light output of 54,000 photons/MeV and excellent energy resolution of 3.4% at 662 keV (FWHM) using a photo multiplier tube (PMT) was reported [1]. However, its decay is as long as around 4 μs . In order to accelerate the decay time, we investigated optical and scintillation properties of Hafnium-halide-based materials such as Tl-doped Cs_2HfCl_6 (Tl:CHC), Cs_2HfX_6 single crystals (X = Cl, Br, I) grown by the vertical Bridgman technique. We succeeded in growing several crystals such as Tl:CHC and Cs_2HfI_6 (CHI). CHI had red-emission wavelength around 650 nm, and the CHI emission would be originating from self-trapped exciton or defect luminescence, as well as CHC. Moreover, CHI had a fast decay time of $\sim 2.5 \mu\text{s}$, and high scintillation light output up to $\sim 70,000$ photons/MeV. In this presentation, we report several novel scintillators with faster decay time than CHC using a photo-multiplier tube, Si-avalanche photo-diode and Si- photo-multiplier (MPPC) due to green and red emission wavelength.

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