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Luminescent and scintillation properties of LFS-3 and GAGG:Ce crystals

Many of the contemporary photonics technologies dealing with detection of radiation owe their existence to diverse scintillation materials. The scintillators play a decisive role in the registration of X-rays and ɣ-quanta necessary in many fields of application in industry, medicine, fundamental research, and security where they are used to convert high-energy photons into visible light. Co-doped LFS-3 and mixed GAGG:Ce recently developed from Zecotek Photonics Inc. and Furukawa Co Ltd companies respectively. These crystals are very fast, with high density and very high light output. Their absorption, excitation and emission spectra were measured and compared. Results indicate that the difference between the emission intensities among GAGG:Ce samples seems to be more pronounced than in the case of LFS-3 crystal samples. However, the relative average deviation of the emission intensities does not exceed the experimental error. Moreover, pulse amplitude spectra were performed using for excitation a 137Cs gamma-radiation source. A standard Ø40x40 mm NaI(Tl) detector was used for reference and values of energy resolution and light output (% to NaI(Tl)) were determined. Energy resolution was measured by reading out the light emerging from one end (3x3 face) of the crystals, using a Hamamatsu R1307 PMT connected to an appropriate amplifier and a Multy Channel Analyzer (MCA). Best energy resolution values of 7.3% for a 3x3x20mmˆ3 GAGG:Ce crystal sample and 8,9% for a 3x3x10mmˆ3 LFS-3 sample were recorded.

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