

## Effect of Composition on Scintillation Light Yield of Ce-doped $\text{Gd}_3\text{Al}_{5-y}\text{Ga}_y\text{O}_{12}$ Nanoparticle Scintillators

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[Introduction] Scintillators are materials that emit light when exposed to ionizing radiation and play a crucial role in radiation detection applications. In addition, some applications have been reported using scintillator nanoparticles as an in-vivo light source upon irradiation from the outside. In our previous work [1], we have developed Ce-doped  $\text{Gd}_3\text{Al}_{5-x}\text{Ga}_x\text{O}_{12}$  (GAGG) nanoparticles. In this study, we optimized the composition to achieve high scintillation yields.

[Experimental] Ce-doped GAGG nanoparticles were synthesized using tartaric acid as a complexing agent with the dissolution of Gd, Al, Ga, and Ce nitrates in an aqueous solution. After room-temperature stirring for 1 d and heating at 80°C for 2 h, the gel was dried, ground, and calcined at 1300°C for 6 h to obtain the nanoparticles.

[Results and Discussion] The scintillation spectra (Figure 1) show an emission peak at 550 nanometers, indicating the 5d to 4f transition of  $\text{Ce}^{3+}$  ions. Pulse height spectra analysis (Figure 2) reveals a clear correlation between Ce concentration and light yield, with concentrations of 0.1%, 0.3%, 0.5%, 0.7%, and 1% showing peak channel numbers of 270, 280, 520, 464, and 300, and light yields of 9,300, 9,600, 17,800, 15,900, and 10,300, respectively.

Reference

[1] Koshimizu et al., Sensors and Materials 35 (2023) 521.

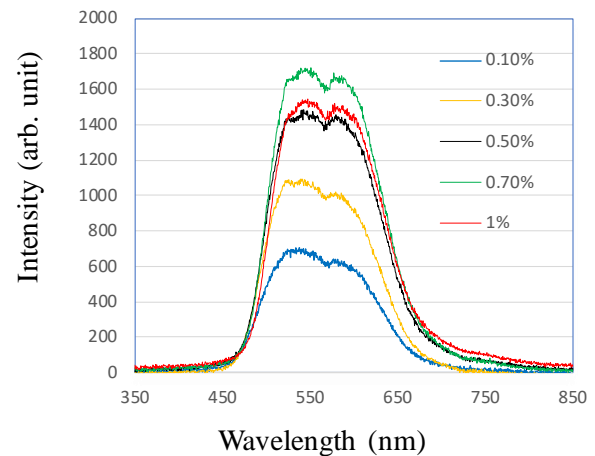


Fig. 1. Scintillation spectrum of the nanoparticles synthesized with different Ce concentrations.

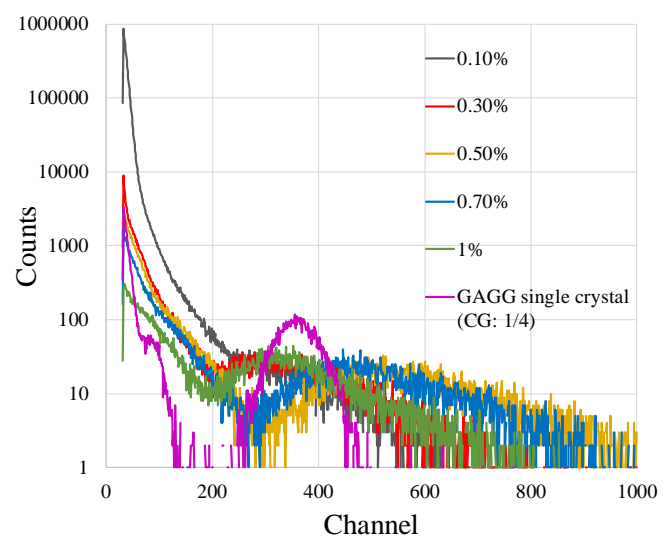


Fig. 2. Pulse height spectra of the nanoparticles with different Ce concentrations.