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Title: Comparative study of scintillation and optical properties of Ga<sub>2</sub>O<sub>3</sub> doped with ns<sup>2</sup> ions

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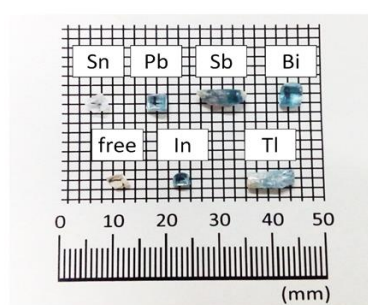
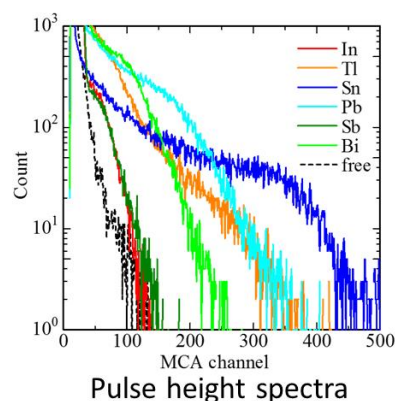
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Comparative study of scintillation and optical properties of Ga<sub>2</sub>O<sub>3</sub> doped with ns<sup>2</sup> ions

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## Graphical abstract

Non-doped and  
ns<sup>2</sup> ion-doped Ga<sub>2</sub>O<sub>3</sub>

Pulse height spectra

## Highlights

- Ga<sub>2</sub>O<sub>3</sub> crystals doped with a series of ns<sup>2</sup> ions were synthesized by the FZ method.
- The PL and scintillation are mainly due to defect-related luminescent centers.
- The decay analyses revealed a presence of ns<sup>2</sup> ions optically activated in Ga<sub>2</sub>O<sub>3</sub>.
- Sn-doped Ga<sub>2</sub>O<sub>3</sub> showed the highest scintillation light yield among the samples.

## Abstract

Ga<sub>2</sub>O<sub>3</sub> crystals doped with nominally 1% ns<sup>2</sup> ions (In, Tl, Sn, Pb, Sb and Bi) were synthesized by the Floating Zone (FZ) method, and we systematically evaluated the optical and scintillation properties. The peak emission was observed around 2.8 eV in photoluminescence (PL) under the excitation energy of 4.68 eV and around 3.0 eV in scintillation under X-ray irradiation. The PL and scintillation decay times were approximated by a sum of three exponential decay functions; and the derived decay times ranged several tens of nanoseconds, hundreds of nanoseconds and several microseconds. The slowest component was ascribed to the nsnp-ns<sup>2</sup> transitions while the fastest and intermediate components were blamed for the defect-related emission. Among the present samples, Sn-doped Ga<sub>2</sub>O<sub>3</sub> showed the highest scintillation light yield.

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