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Fabrication of thallium bromide thin film using vacuum evaporation method

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Thallium bromide is a compound semiconductor with high atomic number and density and wide bandgap. Therefore, thallium bromide has potential as a direct conversion type radiation detector that can operate at room temperature.
One application for semiconductor detectors is for low-energy X-ray applications such as mammography and pathology, where the high stopping power of thallium bromide allows for a thinner detector. Thinner detectors can also compensate for thallium bromide's disadvantage of low carrier mobility. However, the method of fabrication differs greatly between bulk crystals fabricated by the conventional CZ method and thin films fabricated by vacuum evaporation. In addition, since the melting point of bromine is lower than that of thallium, it is necessary to confirm that the bromine is correctly vacuum evaporated as a compound. Therefore, it is necessary to verify the crystal structure and electrical characteristics required for a radiation detector.
Therefore, the purpose of this study is to fabricate a thin film of thallium bromide and verify its crystallinity, elemental analysis, and current-voltage characteristics.
In this study, a total of two types of samples were prepared by vacuum evaporation of thallium bromide on SiO2 and silicon substrates. The crystallinity of the samples was analyzed by X-ray diffraction. Thallium electrodes were deposited on the thin film samples, and current-voltage characteristics were measured.

Topics

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