

Directional X-ray response of mercuric bromide films

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HgBr₂ was synthesized from HgO, HNO₃ and NaBr in aqueous solution. The material was then purified by two sublimations at 280 °C and with an initial pressure of 4×10^{-3} Pa. HgBr₂ films were grown by the Physical Vapor Deposition (PVD) method onto 1" x 1" glass substrates. Growth conditions were a source temperature of 120-220 °C and a growth temperature of 50-140 °C; growth time was between 2 and 16 hours at an initial pressure of 4×10^{-3} Pa. The thickness of the films was between 100 and 1500 μm. For studying the anisotropic X-ray response of the films, growth conditions of no-adhesion between film and substrate were used: a source temperature of 190 °C, a growth temperature of 80 °C and a growth time of 2 hours. Films of about 1500 μm in thickness were obtained, and were characterized by SEM and AFM. Detectors were then constructed in order to check the response of the films along and perpendicular to the substrate plane, by palladium thermal deposition, palladium wire attachment with aquadag and acrylic encapsulation. Whatever the direction, electrodes were ohmic. Resistivities in the order of 10^{11} Ω.cm for both 10^{12} Ω.cm were obtained when dark current were measured perpendicular or parallel to the substrate. When irradiated with ²⁴¹Am source, films gave signal to noise relations of 1.5 at 50 V in both, for perpendicular and parallel conduction respectively. Detectors are not sensitive to light, therefore they do not need light shielding when used as X-ray sensors. Resistivity and X-ray response results show similar values for both, perpendicular and parallel conduction. This result does not agree with the expected anisotropy that may be attributed to a layer compound. However, the lack of orientation of the film microcrystals, confirmed by SEM images, may be responsible of this result.