

X-ray analysis of pulsed laser deposition of Bi_2Te_3 thin film layer

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In this study pulsed laser deposition method was used to prepare Bi_2Te_3 thermoelectric thin films on a soda lime glass substrate at room temperature. The effect of thermal annealing in vacuum on microstructure and surface morphology of films was investigated over a wide range of temperature. The results demonstrate that annealing induces a transition from amorphous to polycrystalline structure and increases electrical conductivity. Crystal structural and phase evolutions were monitored by X-ray diffraction analysis using during deposition. AFM (atomic force microscopy) was used to study of surface morphology for Bi_2Te_3 thin films deposited on soda lime glass substrate. The electrical conductivity measurement was monitored by modified for point probe system. The sample was mounted inside a high vacuum-annealing chamber, which equipped with oxygen and inert gas pressure sensors. The operational pressure was bellow than 10^{-3} Pa for argon atmosphere. X-ray diffraction analysis indicates that the film annealed at 300°C for 120 min appears in large grain size polycrystalline structure but film annealed at 400°C in the same condition has a preformed crystal growth texture in (006) direction.