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X-Ray Diffraction Analysis of PbI_2 Deposited by Solution Technique

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Abstract

The present study considers microstructure characterization of deposited lead iodide layer which is very promising in X-ray imaging due to its high atomic number. Grain growth can result in a dramatic increase in the average crystal size also it can result in changes in the crystal orientation. Grain growth was characterized by X-ray diffraction (XRD) and subsequently analyzed. The dependence of structural parameters on doping element and doping concentration was investigated. It was found that the structure parameters are correlated with both doping concentration and doping metal.

Keywords: Line profile analysis, Microstructure parameters, PbI_2

Introduction

Lead iodides PbI_2 is a promising compound semiconductor material for X-ray imaging devices [1-4]. It is difficult to grow large crystals of PbI_2 with good uniformity; as a result, they are not well suited for applications such as imaging devices which require large surfaces [5-8]. Using thin polycrystalline layer instead of single crystal wafer is an alternative approach to overcome this difficulty which takes advantage of intrinsic properties of lead iodide [9].

Meanwhile efforts are still being made to improve the methods of purification of the starting material [10,11]. Deposition of PbI_2 polycrystalline layers from solution is a very comfortable and reliable technique [8,9,12], the basic principle consists in the controlled precipitation on substrate in order to form a film. Hence, the characterization of the electrical and structural properties of such layers is therefore a great concern both for evaluating their ability to fulfill the requirements needed and for improving their preparation. For optimal device performance, bulk or thick films should possess specific electrical and optical properties, which are strongly influenced by the microstructure quality of the films such as crystalline or amorphous state,